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How the Black & Decker Drill Is Built

Machining on Automatic Turret Lathes—Shaping and Hobbing Gears—Successful and Unsuccessful Fixtures—Heat-Treatment—Testing by Prony Brake

By S. ASHTON HAND
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WHILE the component parts of portable electric drills require good workmanship, the amount of labor necessary in their production is comparatively small owing to the use of automatic machines.

One of the drills made by the Black & Decker Manufacturing Co., Towson Heights, Baltimore, Md., is shown disassembled in Fig. 1.

The field case, gear case and gear-case cover are aluminum castings. The outside of the field case is hexagonal in shape except at the ends which are round.

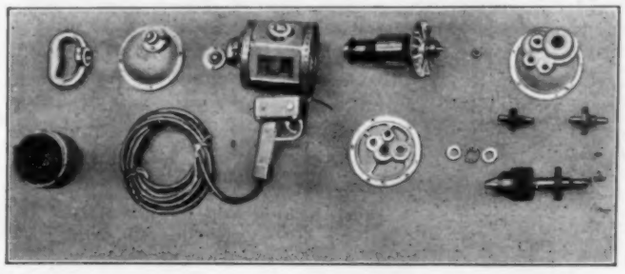


FIG. 1—PARTS OF THE BLACK & DECKER DRILL

This shape, with the round interior, gives greater strength with the same amount of metal than would be the case if the case were round both inside and outside and provides extra thickness of metal at the corners of the hexagon. If the drill were dropped it would probably strike on one of the corners where the greater thickness of metal would protect it against injury.

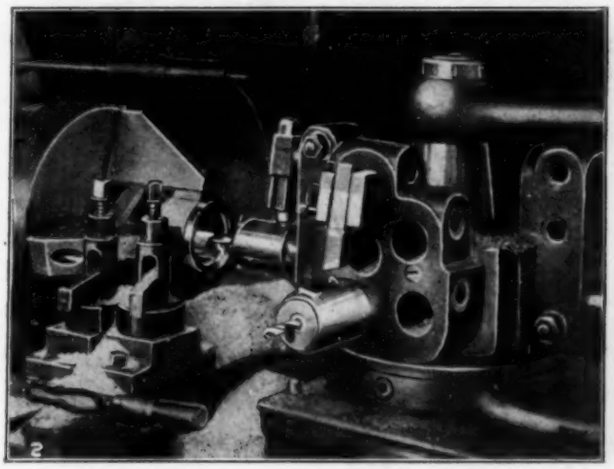
The hexagonal shape of the field case is an aid in its machining as the flat sides of the hexagon form excellent bearings for chuck jaws and but little pressure is required in chucking, as the wide bearing of the chuck jaws on the flats prevents the case from turning, consequently the danger of distortion from tight squeezing in the chuck is greatly eliminated.

Field cases are machined on Potter & Johnson automatic turret lathes as shown in Fig. 2. Rough- and finish-boring, turning and facing, together with spotting, drilling and reaming the central hole at the rear are all done in one chucking at the rate of 150 in 8½ hours.

Gear cases and covers are likewise turned and faced in Potter & Johnson machines. Fig. 3 shows a gear-case cover in the chuck and the tool set-up in the turret and on the toolslides of the carriage.

Drilling a field case for attaching gear cases and covers is done on a Natco multiple-spindle drilling machine as shown in Fig. 4. In operation, the field case is located by a pilot on the fixture *A*. The jig plate *B* is lowered simultaneously with the drilling head until it rests on the work. Further lowering of the drilling head to bring the drills into action, compresses the springs *C* and *D*, pressing the jig plate down on the work and holding it firmly in position. The production is 500 in 8½ hours.

As the armature runs at a very much higher speed than the spindle it is necessary to make considerable reduction between the two and as the space in the gear case is limited, the gears are compounded. In order that the gears shall run as noiselessly as possible the center distances of the holes in the gear case must be very accurate. The jig shown at *A*, Fig. 5, was made for drilling and reaming the holes to receive the bronze bushings that act as bearings for the gear shafts, the hole in the center of the gear case being bored and reamed at the time the case is turned, recessed and



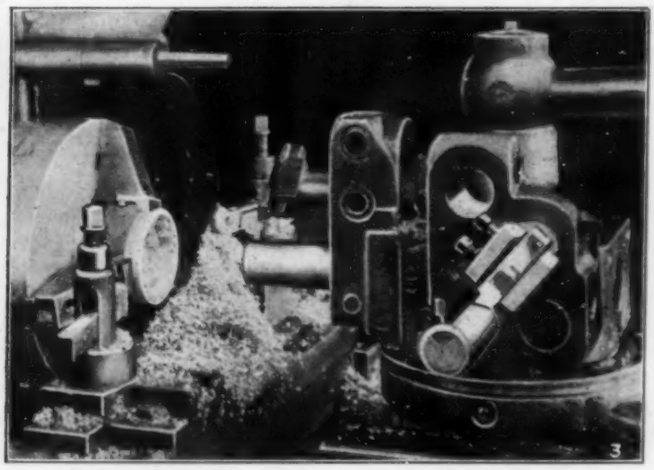
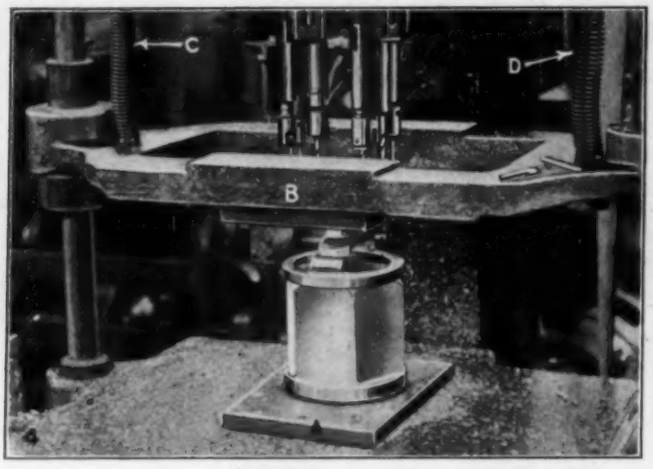


FIG. 2—MACHINING FIELD CASES. FIG. 3—MACHINING GEAR-CASE COVERS



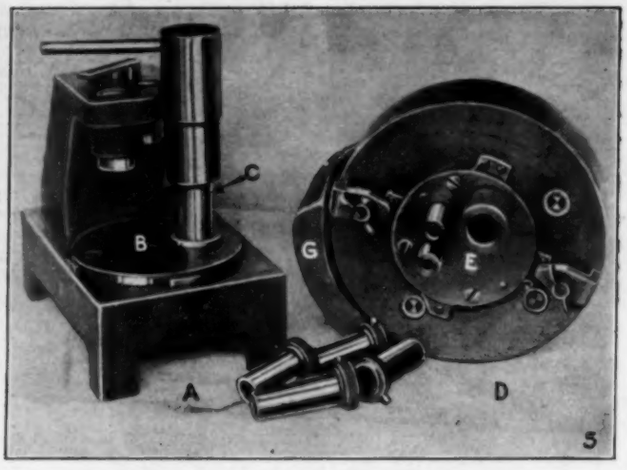


FIG. 4—DRILLING FIELD CASES. FIG. 5—FIXTURES FOR BORING GEAR CASES

faced. Notwithstanding that the jig was made with great care and that the work was located on the pilot *B* and held by the snug fitting, hardened and ground, plug *C*, through a hole previously drilled and reamed, the jig did not produce work having the accuracy demanded. The jig failed in its mission because it was impossible to have drills and reamers fit tightly enough in the bushings to prevent more or less crowding to one side or the other while doing the work.

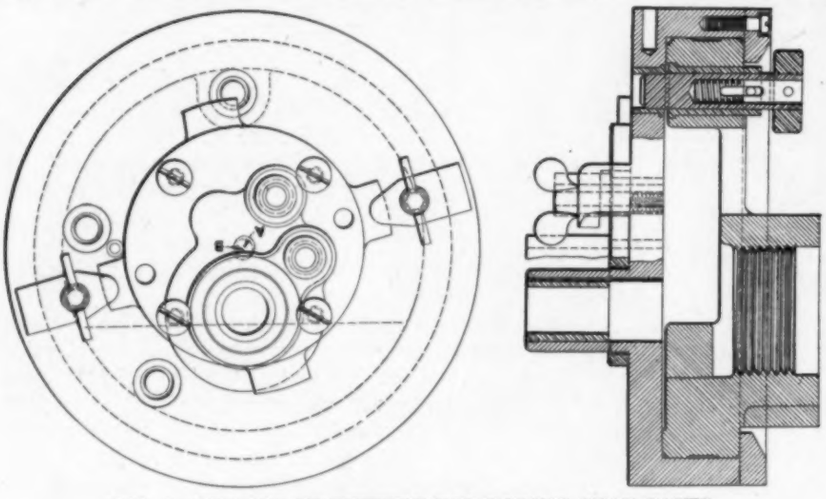


FIG. 6—DETAILS OF FIXTURE FOR BORING GEAR CASES

It was then decided to make a fixture for drilling and reaming the holes and to mount it on the spindle of a turret lathe so that the work would revolve and the tools remain stationary, except for motion in the direction of feed. Accordingly the fixture *D*, Fig. 5, was made and has given satisfactory results. The work is located on the pilot *E* and held by the clamps shown.

To insure further accuracy, the turret tools for boring and reaming are piloted in the bushings to be seen projecting from the work pilot *E*. As the holes in the work are grouped, though not equidistantly, about the center it is necessary to mount the fixture eccentrically on the machine spindle and to counterbalance it by the weight *G* to overcome vibration.

The whole front of the fixture is indexed for the holes around a plug, and held in any one of the desired positions by an index pin at the rear.

As previously stated the centers of the holes in the work are not equidistant from the center of the fixture and these unequal distances render it necessary to locate the pilot *E* out of the center so as to bring the centers of the holes equidistant from the indexing center.

Details of the fixture are given in the line drawing, Fig. 6, where *A* represents the center of the pilot and *B* the center of indexing.

All the holes are bushed with bronze to make good wearing bearings for the gear shafts. The bushings are made in a Cleveland automatic screw machine with magazine attachment as shown in Fig. 7, where they can be seen in the magazine at *A*. The blanks are double the length required and are drilled, reamed and rough-turned for one-half of their length, then reversed in the magazine when the former operations are repeated and the blanks cut in half, each blank making two bushings. The operations of the machine are entirely automatic, the only work required on the part of the operator being to keep the magazine loaded. The outside diameters of the bushings are finish-turned in a subsequent operation.

Pinions and gears all have stub teeth and are cut either on Fellows gear shapers or on Barber-Coleman hobbing machines, operations on the former being shown in Fig. 8 and on the latter in Fig. 9.

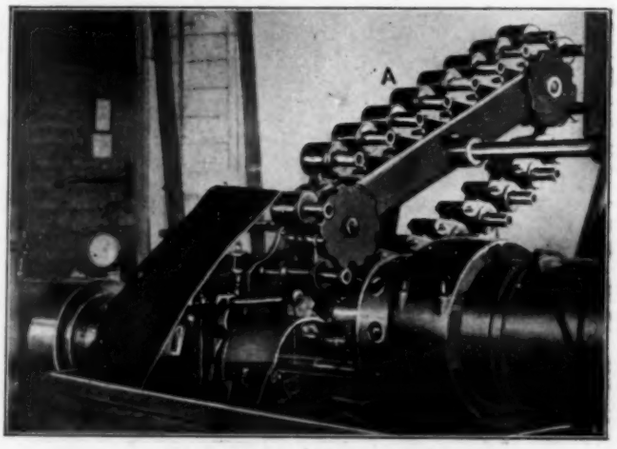
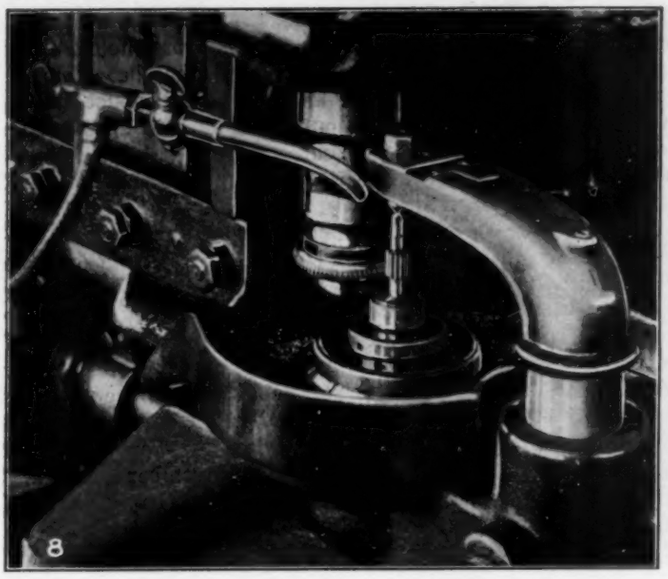


FIG. 7—MAKING BEARING BUSHINGS



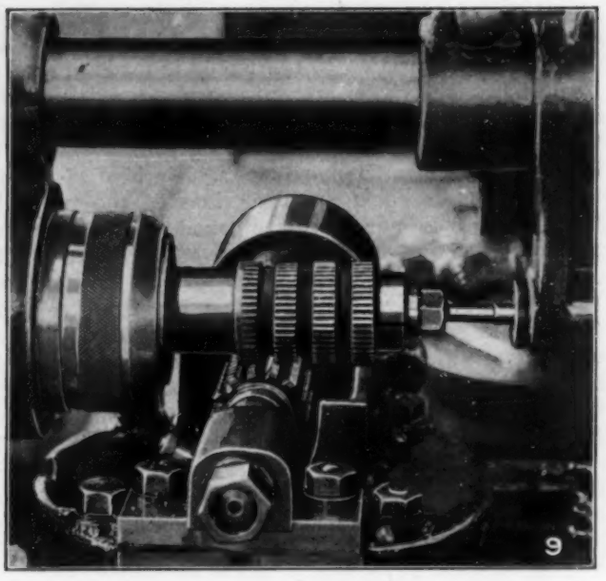


FIG. 8—CUTTING PINIONS. FIG. 9—HOBBING GEARS

Gear and pinion blanks are made from bar stock in automatic machines. All pinions, except the armature pinion, are integral with their shafts, the armature pinion being internally threaded and screwed on to the armature shaft. As before stated, the gears are compounded, a gear being mounted on each pinion shaft and arranged in the gear case in the same way as the gears in a clock or watch. The gear seats on the pinion shafts are knurled to make the gears a tight fit when pressed on.

The gears and all other steel parts are heat-treated, being brought to temperatures suited to the work they have to perform and then quenched in oil and drawn by holding them in molten saltpeter for 10 min. and finally quenched in water. The average heat for the first treating is 1,450 deg. F., and for drawing in saltpeter, 750 deg. F. Before heating, all parts are washed in soda water to remove the grease and to prevent the formation of scale.

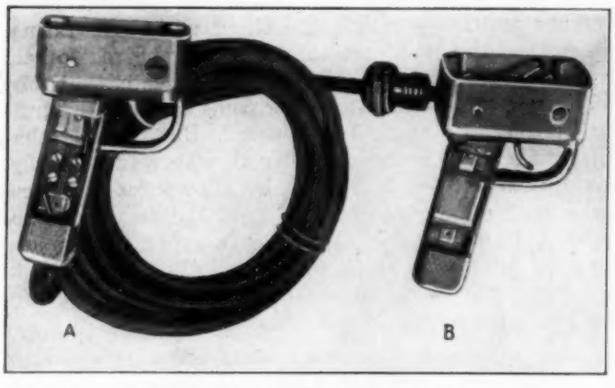


FIG. 10—SWITCH HANDLES

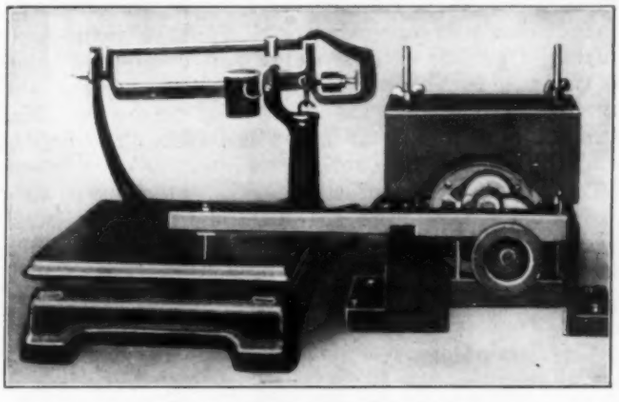


FIG. 12—WEIGHING THE LOAD

The switch handles shown in Fig. 10 are die-cast

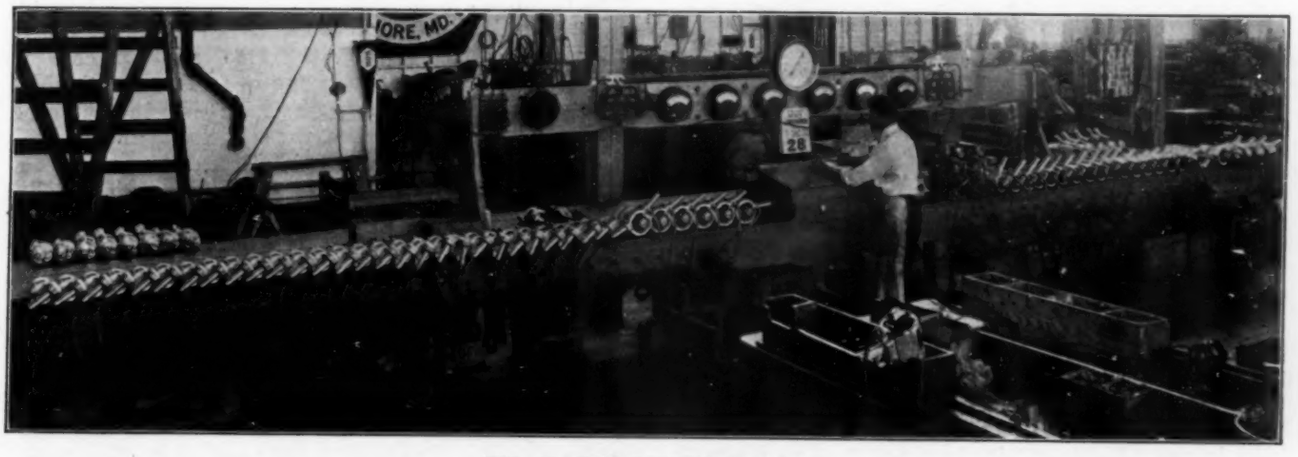


FIG. 11—THE RUNNING TEST

aluminum, the one at *A* having the wiring and insulating blocks in place while the one at *B* has not.

Electrical connection to the motor is made or broken by pressing the trigger which imparts a quarter turn to an insulated block spanned by brushes and having contacts on two opposite sides. The brushes are long and the block on which they are mounted is pivoted so that their tension is equal on both sides of the revolving block. All leads and wires are conected by screws and as no solder is used, the wires can be connected or disconnected by the use of a screwdriver.

The ball retainers for the thrust bearings are made from brass rod on a Brown & Sharpe automatic screw machine and then jig drilled for the ball pockets. The thrust washers are made from steel bars, hardened and then ground on a Heald rotary surface grinder, being held on a magnetic chuck.

All drills are run on a test for 2 hr. on the bench, shown in Fig. 11, which holds about 150 drills when fully loaded. After the running test each drill is given a brake test by the small Prony brake shown in Fig. 12. The length of the brake lever is 1 ft. from the center of the pulley to the center of the screw that bears on the scale platform. To pass this test the drill must deliver the full rated power without slackening in speed when the scale beam tips at 5 pounds.

The brake is lined with brake lining so that it is not necessary to use any oil.

The armatures and field coils are purchased from outside so that no electrical winding is done on the premises.

Samples of the insulated wire furnished with the drills are given periodic practical tests for the ability of the insulation to stand up under great abuse. For instance one sample of wire was laid across the roadway where it would be subject to all kinds of weather and to being run over by automobiles and heavily loaded trucks. This wire was put out in November, 1921, and tested weekly for breakage and leakage. In April, 1922, it was still in good working condition.

Forced and Shrink Fits—Discussion

BY FRANK C. HUDSON

On page 210 of *American Machinist*, W. S. Standiford gives allowances for press and shrink fits which are so much greater than usual practice as to attract my attention immediately. They seem to average about double the usual allowance so, in order to make sure that the practice has not changed enough to make me a back number, I secured data as to the best practice of some of the modern shops. These data seem to bear out my impression that the allowances given by Mr. Standiford are much too great and should not be depended on for average work.

The Nordberg Manufacturing Co., which is a well-known builder of large engines and air compressors, uses 0.001 to 0.0015 in. per inch of diameter up to a 12-in. shaft. Above 12 in. it uses 0.001 in. per inch of diameter.

The Chandler & Price Co., makers of printing presses in Cleveland, Ohio, has smaller sizes. Its table is of special value because it gives both diameter and length of hole as well as the pressure required. It should be noted that the table gives total pressure and total oversize allowance on the shaft. The table is as follows:

TABLE OF FORCE FITS AND PRESSURES

5 tons pressure

Diameter of hole	Length	Oversize of shaft
2½ in.	3 in.	0.003 in.
3 in.	3½ in.	0.003 in.
3½ in.	3½ in.	0.003 in.

3 tons pressure

Diameter of hole	Length	Oversize of shaft
2½ in.	3 in.	0.002 in.
3 in.	3½ in.	0.002 in.
3½ in.	3½ in.	0.002 in.

A well-known railroad, which does not wish to be quoted, gives $\frac{1}{16}$ in. per foot of diameter for shrinkage of tires on its older locomotives, and $\frac{3}{32}$ in. per foot of diameter on the newer and heavier power. These are, of course, shrink fits.

In only one case, that of a locomotive shop which also desires to remain incognito, do I find allowances as great as those proposed by Mr. Standiford. On cast-iron wheels the allowance varies rather erratically from 0.002 in. per inch of diameter on a 2-in. bore, to nearly 0.003 in. per inch on a 7-in. bore and back to 0.002 in. on a 12-in. bore. The pressures given vary from 7 to 9 tons per inch of diameter.

For cast-steel or rolled-steel wheels the allowance is increased to 0.005 in. per inch for a 2-in. bore, but drops back to 0.003 in. per inch for a 7-in. bore and to a trifle over 0.002 in. per inch for a 12-in. bore. Pressures run from 11 to 15 tons per inch of diameter. These allowances seem to be based on the amount of pressure which the wheel will stand without bursting, rather than the allowance and pressure required to hold them on the axles. These figures indicate that Mr. Standiford's allowances may not come as near to bursting the piece as might be supposed. But the fact that other makers use a much smaller allowance successfully, would seem to show that excessive allowances and pressures are seldom necessary to hold the two parts together. It is certainly desirable in every way to use the least allowance which will give satisfactory results in holding the parts together. This reduces stresses and the parts go together more easily.

Use of Double-Acting Machines

BY ROBERT GRIMSHAW

If the double-acting steam engine is a step in advance from the single-acting, why not apply the same principle wherever practicable? We already see the advantage of the double-acting wire-nail machine, the heavy recoil of which, after heading one nail, is not taken up uselessly in the bearings, but utilized in making another nail at the other end of the machine. Of course, owing to the necessity of putting in fresh coils of wire, and of sharpening, replacing or adjusting the cutting-off bits and the heading dies, the capacity of the double-acting nail machine is not twice that of the single on the same size product and with the same length of wire in all the spools. But the difference in labor cost and power consumption per product unit is marked, and pays.

The metal planer seems to me to be the best subject for thorough experiments in double acting. I think that the "jack-in-a-box" tool, such as one finds once in a while in Great Britain, might be used to advantage, with the same table speed—that at present used in cutting—in both directions. This would also diminish the jar occurring at present at the end of the back trip.

Methods of Machine Tool Design

Further Continuation of the Section on Feed Mechanism—Concluding the Discussion of Lead Screws—Various Types of Feed Screw Nuts—Thrust Bearings

BY A. L. DE LEEUW
Consulting Editor, *American Machinist*

A PECULIAR use is made of the feed screw in connection with hydraulic feed. For the very heaviest kind of turning and boring, feed pressures are required beyond the capacity of a screw of practicable size. Generally speaking there is, of course, no reason why a screw could not be used with a diameter of 10 ft., but practical considerations such as the size of bearings, nuts, especially if half nuts are used, etc., limit the size. On the other hand, it is a very simple matter to obtain almost any feed pressure by means of hydraulic apparatus. If, for instance, water were used under a pressure of 1,000 lb. to the square inch, which is a very moderate pressure for a hydraulic cylinder, and if a feed pressure of 300,000 lb. were required, which is very high, it would be necessary only to have a hydraulic cylinder with an area of bore of 300 sq.in. which requires about a 10-in. bore. On the other hand, it is exceedingly difficult to regulate the amount of advance per minute when using hydraulic pressure. Differences in sharpness of the tool, size of cut, and nature of the material, would make the tool advance sometimes fast, sometimes slow, and it would be practically impossible to keep the advance uniform under all conditions of the cut.

THE USE OF AN AUXILIARY MECHANISM

When it is necessary, then, to use hydraulic apparatus in order to obtain the required pressure, some auxiliary mechanism should also be used to regulate the speed of advance. A mechanism of this kind might be called a releasing mechanism, because it will hold back the action of the hydraulic pressure until this mechanism is set in motion and then it permits the hydraulic piston to advance at a speed determined by the speed of this auxiliary mechanism. One interesting way of obtaining this result is the following: An extension of the piston of the hydraulic cylinder is provided at one end with a steep screw thread. By some means or other the piston is prevented from turning. As this piston advances the screw thread must pass through its nut and, of course, cannot do so without rotating it. By making the angle of spiral of the thread greater than the friction angle it is possible to have the screw overhaul the nut. If the angle of the thread were very close to the friction angle, say a few minutes only, it would be able to drive the nut; but a small resistance brought to bear against the nut would prevent it from turning and would stall the piston. If this resistance were released—that is, if the nut were permitted to turn—the piston would advance and the full pressure of the hydraulic cylinder would be exerted against the member driven by the piston.

It is, of course, exceedingly difficult to determine beforehand exactly what angle should be used, particularly so as the conditions of metal of screw and nut cannot be predicted. There might be a difference of several degress in the friction angle between two screws and nuts made of the same material. In order to overcome this difficulty the spiral angle is made large enough to be certain that it exceeds this friction angle; and to overcome the difficulty which then arises, namely that considerable pressure must be brought to bear against the nut in order to keep it from rotating, the following method is applied:

The outside of the nut is made into a wormwheel and the angle of the teeth is such that it will overhaul the worm. To be sure again that the angle of the teeth will be sufficient, a reasonable excess is allowed, so that one will be sure that the angle is more and never less than the friction angle. Instead of applying the resistance against the nut, we now apply the resistance against the worm. The fact that we have allowed for a certain excess of angle in the screw may cause the nut to require a resistance of quite an appreciable percentage of the total load. However, it is well possible to keep this percentage down to less than 10. In that case, a resistance of 10 per cent of 300,000 or 30,000 lb. would be required at the diameter of the thread; or, let us say, 20,000 lb. at the outside of the nut or the pitch diameter of the wormwheel.

Allowing again for an excess of 10 per cent, we would then have to apply a resistance of 2,000 lb. to a diameter equal to the pitch diameter of the worm, or of 1,000 lb. to a diameter twice as great. A positive feed mechanism can be arranged giving all the necessary feeds required for the machine, and of which the last member is not directly applied to the carriage or boring head, but to a disk or gear or some member keyed to the shaft of the worm. The pressure required at that point being only 1,000 lb. can easily be supplied by the positive feed mechanism.

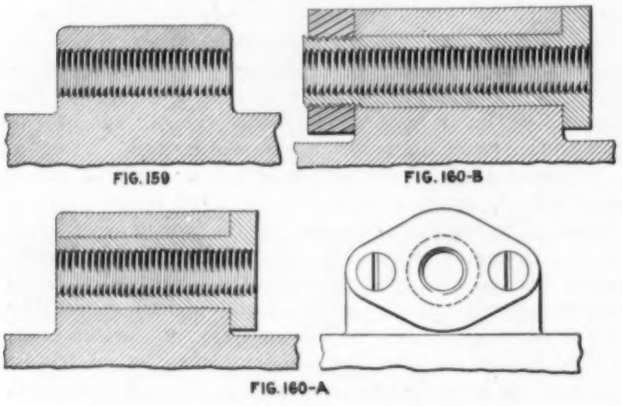
ALLOWS FOR AMPLE PRESSURE

So long as the pressure in the hydraulic cylinder is sufficient to make the tool penetrate the amount prescribed by the positive feed mechanism, the feed will be uniform; but if the hydraulic pressure is not sufficient to cause the tool to penetrate, then the positive feed mechanism would have to supply the additional feed pressure required. As this might be quite considerable, it is advisable to allow for a rather large excess of hydraulic pressure so that at all times there shall be enough pressure for the penetration of the tools. Mechanisms of this kind have been successfully applied to large ingot boring and turning lathes.

In the previous paragraphs mention has been made of the desirability of large lead for feed screws. The amount of lead depended to a certain extent on the diameter of the screw, the essential requirement being that the angle of spiral should be rather large. When a screw is used as lead screw there is another requirement of equal importance, especially if the screw is used for thread cutting.

If a lead screw were made with 1-in. lead and we had to cut threads of 1, 2, 3, 4, 5, 6, pitch, and if we used the open and closed nuts, we would have the following condition: The operator throws the nut in, takes the first cut, throws the nut out at the end of the cut, returns the carriage, sets the tool in a certain distance, and throws the half nut in again. It makes

no difference what time he throws this half nut in, he is bound to catch the thread again which he has cut. Suppose the nut had been thrown in for the first cut in such a position that a thread which we will call *A* is in the center of the nut, and suppose we call the threads to the right of this *A* + 1, *A* + 2, *A* + 3, etc.; and to the left *A* — 1, *A* — 2, *A* — 3, etc. Suppose, then, that we should have thrown the nut in on the second pass in such a manner that thread + 2 had come in the center of the nut; then this would simply mean that two complete revolutions of the screw are required before things are in the same condition again as on the first pass. The same thing would have happened if we had thrown it in on — 2, provided, of course, that there was room enough between tool and work to make such a thing possible. Speaking in general, the lead of the screw should be a multiple of all the different leads to be cut in order to make it possible to throw a half nut in without any precautions. This means that the lead must be either 1 in. or a multiple. If the lead were ½ in. it would have produced the same result when we throw the nut in on + 2, but not when we throw it



FIGS. 159 AND 160—FORMS OF LEAD SCREW NUT CONSTRUCTION

in on + 1 or + 3, because this would have the tool brought to the right ½ in. or 1½ in. and this is not a multiple of the lead to be cut. This lead of ½ in. would have been all right for ½ in. or ¼ in. or ⅛ in. or ½ in. pitch, but not for ⅓ in. or ⅙ in. or ⅐ in. pitch.

Giving the lead screw a lead of 1 in. meets all commercial threads except 11½ per inch. This thread also might be included if the lead of the screw were 2 in. but, as a rule, this is too much for moderate sized lathes on which threads of 11½ to the inch are apt to be cut. The common practice of making lead screws with ¼ in., ⅓ in. or ½ in. lead should be discouraged, as it is very well possible, even in moderate sized lathes, to give the screw a lead, though not necessarily a pitch, of 1 in.

The simplest way to construct a nut for feed or lead screw is to cast a lug to the member to be moved and tap it out to suit the screw. Though this may be the simplest in principle, it is not necessarily the simplest in execution because it may be difficult to get at the nut for tapping. Besides, merely tapping a hole would not be satisfactory for larger or more accurate work and where the nut is made in one with a large casting it becomes exceedingly difficult to chase it in a lathe. Fig. 159 shows this simple construction. Fig. 160 A shows a better construction. Here the lug of the casting is merely bored out and faced. The nut is made cylindrical in form and provided with a flange so that it can be bolted on to the lug of the main casting. It is possible now to turn this nut and chase it in the lathe and for a higher degree of accuracy it can be put on a threaded arbor and finish-turned or ground from

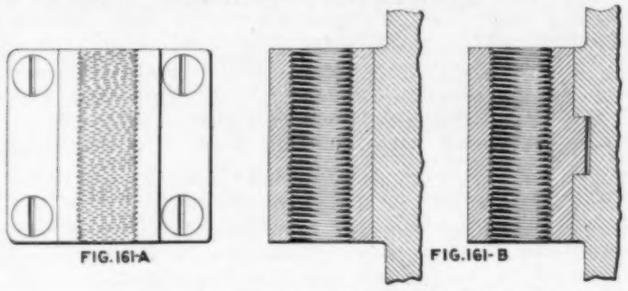


FIG. 161—BOLTED-ON LEAD SCREW NUT

the thread, so that there is a reasonable assurance that the thread will be concentric and in line with the bored hole in the lug.

Fig. 160 B shows the same construction with the exception that a collar has been provided at the end of the nut opposite the flange. When pressure occurs in one direction only, or when the pressure in the opposite direction is always light, a construction such as shown in Fig. 160 A is satisfactory; but when there is a possibility that heavy pressure may be exerted in the opposite direction, then it is not safe to rely on the necessarily small screws which hold the nut to the casting. The collar at the other end of the nut takes care of this pressure.

A nut bolted to the casting is shown in Fig. 160 A. This may have certain advantages when conditions of the casting are such that the boring out of a lug would be difficult. With this construction, however, one depends entirely on the resistance of the bolts against shear. It is frequently difficult to get bolts of sufficient size or in sufficient number for the fastening of such a nut because of the probable crowded condition of the mechanism.

Even without such a condition, it is unwise to have the fastening of the nut in shear. To overcome this objection, a nut is often made as shown in Fig. 161 B where it is provided with a pilot. This pilot may be round, as shown in the illustration, a tongue cast on to the nut, or even a cross key. The tongue and cross key require cross planing of the piece, which may be difficult to accomplish. It is always easy to provide a hole for a pilot. This, however, offers another practical difficulty which should be considered when a selection is made of the nature of fastening of the nut.

In Fig. 162 the nut is shown in heavy lines and the slide to be moved by that nut in light lines. The screw has its bearings in the slide whereas the nut

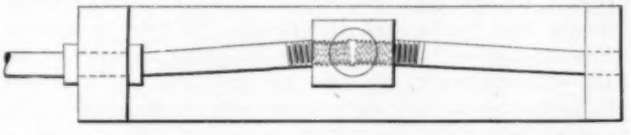


FIG. 162—EFFECT OF BORING PILOT HOLE OFF CENTER

has its pilot in the stationary piece, or vice versa. The pilot of the nut is shown off center. It is always exceedingly difficult to bore this short crosshole exactly central with the centerline of the screw. A small error of one or two thousandths of an inch might not cause much trouble when the nut is central between the two

bearings of the screw, especially if the screw is of a fair length; but if the slide has been moved so as to bring either bearing close to the nut, the screw would bind and might cause serious trouble.

On the other hand, if the construction is as shown

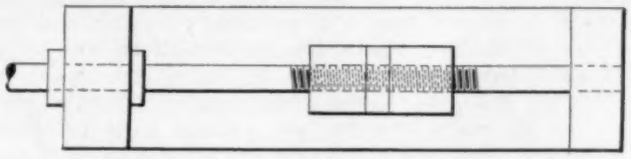


FIG. 163—LEAD SCREW NUT LOCATED BY CROSS KEY

in Fig. 163—with tongue or cross key—a small error in the direction of that key (that is, when it makes an angle of less than 90 deg. with the centerline of the hole), would also cause the same inaccuracy which we found when the pilot was off center, but this inaccuracy has the same effects whether the nut is midway between the two bearings or whether it is close to a bearing. This construction, then, is to be preferred whenever possible. There should be no great difficulty in boring the hole of the nut at right-angles to the tongue or key.

Construction of Half Nuts

Two half nuts are shown in Fig. 164, each provided with a sliding bearing. In the illustration a disk is shown behind the two nuts which can be rotated through an arc of a circle, causing the two pins, shown is dotted lines, to operate in slots in the half nuts to bring them together or move them apart. This is rather a crude construction, as it is very difficult to make all parts so that the two half nuts will bear on the screw simultaneously and in exactly the same manner; in other words, this construction is almost sure to cause one of the two half nuts only to be in action.

Another construction which is often carried out is to have a screw with right- and left-hand thread operate on the two half nuts. This screw can be made floating, that is, it has no abutment in any part except the two parts to be moved. This will insure an even bearing of both half nuts on the screw.

On the other hand, this construction also has its drawbacks. In the one shown in Fig. 164, the two half nuts can be made in one single piece, bored and

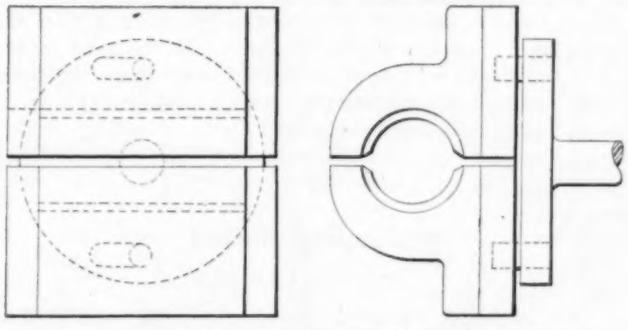


FIG. 164—CRUDE CONSTRUCTION OF HALF NUTS

threaded, and then sawed apart so that each comprises a little less than one-half of the complete nut. In the construction where a right- and left-hand screw is used for closing the nut, it is necessary either to bring the two half nuts against each other or else to provide pins or stops of some kind so that when they have gone as far as they can go, the two halves will make all or the greater part of one circle.

Introducing pins or other stops makes the fitting or assembling a rather delicate job and, on the other hand, if they are made so that they will butt against each other without such a stop, then each half nut must be the exact half of a circle so that the two parts cannot be made in one and later sawed apart. This offers no difficulties when babbitted nuts are used but requires some care if the nuts are made of some metal which has to be machined.

Nuts and screws will wear, like any other part; and many constructions have been proposed to compensate for such wear. One well-known construction is illustrated in Fig. 165 where the nut is made up of two parts, one of which can be advanced or turned through some angle and then fixed again. This, as well as practically all other suggested constructions, meets the difficulty only apparently, not really. If the wear were in the nut only, such a device might meet the problem; but wear takes place in both screw and nut.

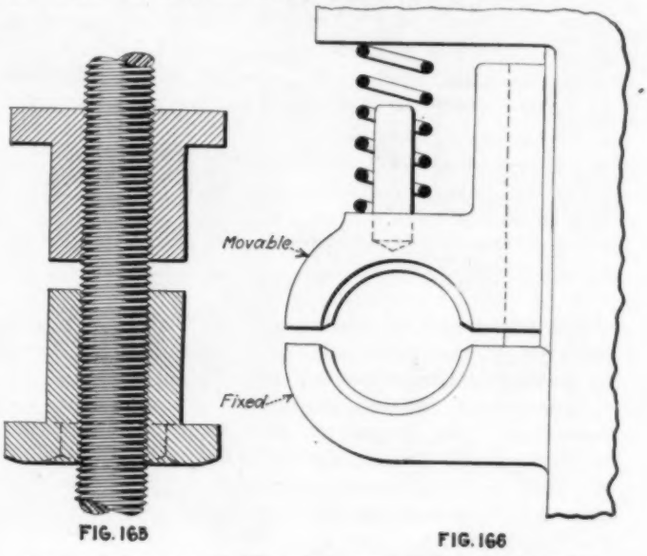


FIG. 165 FIG. 166

FIG. 165 AND 166—TAKE-UP DEVICES FOR HALF NUTS

Again, if the wear in the screw were perfectly even all over, this device might help us out of our trouble. But, in practically all machine tools, the location of a slide when doing work varies from day to day. It may well be that for a long time at a stretch only a short part of the screw has been used for feed and, of course, this part of the screw will then wear more than any other part. If the looseness in the nut is taken up and then a piece of work is placed in the machine which requires another part of the screw to be in action, this screw will be tight in the nut, and, in fact, it may be entirely impossible to use the nut under such conditions. Speaking from a practical standpoint we may say that it is useless to attempt to provide a take-up for the nut for any machine which must do a variety of work. It is, however, possible to utilize such a take-up for a special machine which always does the same kind of work and in the same position.

A take-up which can be used for light work requiring rather great accuracy is shown in Fig. 166. The angle of the thread of the screw is made so as to approach closely the friction angle between screw and nut. It is, in fact, supposed to exceed it by 1 or 2 deg. The half nut (only one-half nut is used here) is held in engagement by a spring, or a set of springs. These springs will force the nut into closer engagement when the screw thread is worn but permit the half nut to be

pushed back by the screw if it meets a part of the screw which is worn to a lesser extent. It will be seen from the construction that this device is not available where heavy work must be done.

Mention has been made in the previous paragraphs of the use of thrust collars or ball bearings in connection with feed screws. It is, of course, a simple matter to provide a take-up when thrust collars are used. A thrust ball bearing requires no adjustment for wear because when the balls or races are worn as little as two ten-thousandths of an inch the bearing should no longer be considered fit for use and should be replaced. For this reason as well as for the purpose of efficiency, ball bearings should be applied whenever possible. However, when very heavy loads are imposed on the screw, neither of these two constructions is entirely satisfactory. Under such conditions as were mentioned

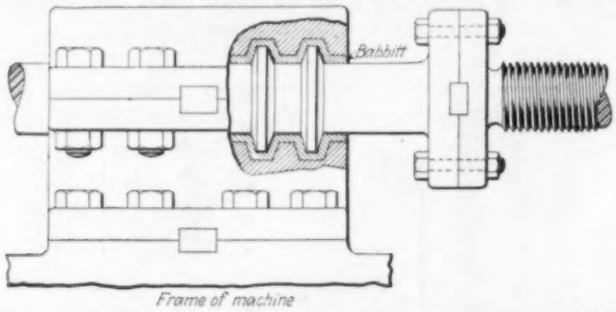


FIG. 167—MARINE TYPE HEAVY-DUTY THRUST BEARING

in the paragraph on hydraulic feeds, ball bearings become impractical although, of course, not impossible. To provide a thrust washer of sufficient area to stand a pressure of 300,000 lb. is out of the question on account of the enormous size such washers would assume. Under these conditions, then, a different kind of thrust bearing should be constructed. The so-called marine thrust bearing lends itself very well for heavy machine tools.

In Fig. 167 is shown such a bearing in diagrammatic form. An extension of the screw is provided with a number of collars integral with the body of this extension. It rests in a capped bearing which is babbitted to fit the thrust collar. A sufficient number of collars is provided to bring the pressure per square inch down to the proper amount under the conditions of lubrication. For instance, if we should be willing to allow 200 lb. per square inch, we would need 1,500 sq.in. of thrust collar surface. If the body of the screw extension should be 7 in. and we allow a height of the collar beyond this body of 2 in., each collar would have an area of practically 50 sq.in., so that thirty of these collars would have to be provided. If this is too much for the available length of such a bearing, we would simply increase the size of the body or the height of the collar. As half of the thrust must be taken up by the bearing itself and half by the cap, provision should be made so that the bolts which hold the cap to the bearing are relieved, preferably by a cross tongue and groove or by a cross key. The box itself, too, if not cast integral with the frame of the machine, should be provided with such a cross tongue or key. Pressures as high as 300,000 lb. are not ordinarily transmitted by a screw, as was mentioned before. However, the writer has been confronted with feed screws transmitting 200,000 lb. pressure and has used the marine type of heavy-duty thrust bearing successfully in such cases.

Suggestions for Improvement in Thermit Welding

The following suggestions not previously published in instruction books on thermit welding will be of interest to welders engaged in repairs to heavy sections made by this method. In previously published directions for making plastic the yellow pattern wax to be applied between sections to be joined by means of thermit welding, it was recommended that the wax should be placed in a pan and warmed until it became plastic or else melted entirely and allowed to cool until it became plastic.

Another way of making wax plastic is to pour the melted wax in a small stream into cold water. Very shortly thereafter, it can be removed with the hands and the water squeezed out. It then will be found sufficiently plastic for use.

After hollowing out a basin in the top of a rammed up mold, a channel or trough should be cut in the top surface of the mold connecting the top of the pouring gate and the top of the riser. This will cause the first slag, overflowing on top of the mold, to quickly run across to the riser and, thus while the metal is very liquid, equalize the pressure on the pouring gate and the riser.

In order to properly preheat a section in a mold without badly burning away the preheating gate, it is necessary to use vaporized liquid fuel (gasoline or kerosene) which can be blown into the mold at such a velocity that the location of the flame can be varied at will. Thus by increasing the velocity at the end of the burner pipe, the lower part of the flame can actually be cooled down and the upper part heated. The flame at all times can be so regulated that the heating gate will be dried out but will not be burned.

This is not the case with any gaseous fuel, whether it be natural gas or illuminating gas, etc., and in all such cases the flame will either start at the end of the burner pipe, or will be blown completely out. This mass of flame passing continually through the restricted heating gate during the entire preheating operation is bound to do considerable harm, and in all cases the lower part of the mold and the section being preheated will be at considerably higher temperature than the upper parts.

Too rich a flame during the early part of preheating may not be harmful, but especially toward the end care should be taken that no excess oil be used as the lean flame will tend to burn out from the molding material any oil which may have penetrated during the early part of the preheating.

Keeping Posted

BY A. L. DEVINNE

The principle of seniority is not always observed in shops and factories. And for this reason, if for no other, the foreman should not only keep abreast of modern practice, but keep posted as to what is being proposed and tried out. As a result, when the time comes for promotion to be considered, he will not see some "dark horse" win against him. If there is any one man about the shop who should be up to date in his line, it is the foreman. He must be a valuable source of information and counsel and he can be that only if he keeps posted.

Manufacturing Radio-Phone Head Sets

Bending and Hardening the Magnets—Molding Poles and Pole Pieces in Earpieces—Winding the Coils for Magnets and Assembling Into Complete Head Sets

By FRED H. COLVIN
Editor, *American Machinist*

WHILE detecting crystals or audion tubes are necessary to catch the vibrations of the air, and the various apparatus which has been shown before is needed to tune the instruments to these vibrations, the head set is really what translates the vibration so that we hear them as sounds. Head sets are, of course, telephone receivers, designed especially for radio work, and contain magnets, coils and diaphragms incased in insulating material.

In the set described herewith, the pole pieces are separate and held in contact with the magnet by the case which forms the body of the earpiece. The maker of this set, the William J. Murdock Co., Chelsea, Mass., is one of the early pioneers in this work, having made wireless or radio apparatus for 17 years before the present wave of enthusiasm swept over the country. Head sets are rated by their resistance in ohms and run from 2,000 to 4,000 ohms as a rule. In most cases this means the total resistance of both earpieces, while in some few cases it means the resistance of each earpiece. A resistance of 1,500 ohms for each earpiece is probably a fair average.

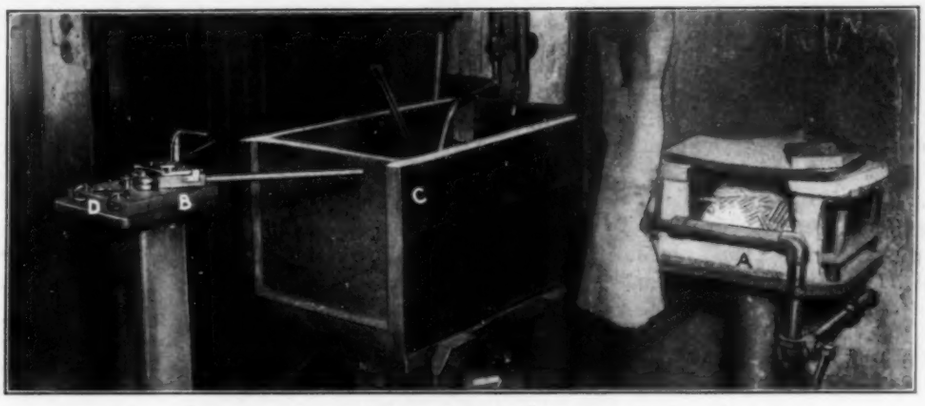


FIG. 1—BENDING AND HARDENING MAGNETS

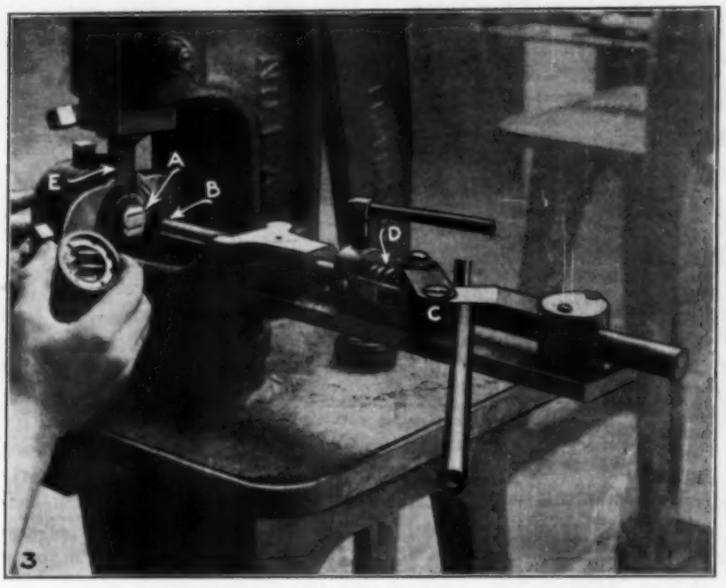
The magnets are made from round magnet stock, which means a good steel, high enough in carbon to harden easily in water, and with a fair tungsten content. The bars are first cut off and then heated in the small gas furnace shown at *A* in Fig. 1. The heated bar is then bent to about two-thirds of a circle in the simple bending fixture shown at *B* and quenched in the tank *C* without being reheated. Two of the completed and hardened magnets are shown at *D*.

The magnets then go to the molding department where they are placed in the molds as at *A*, Fig. 2, together with the pole pieces which have been previously made from sheet steel in a simple blanking and forming operation. Two pole pieces are placed in the mold with the magnet as can be seen at *B*. These pole pieces contact with the open ends of the magnet and are held firmly in position during the molding operation.

Then a piece of insulating material, which by the way is one of the Murdock specialties as the result of years of experimenting, is placed on the mold over the magnet. The operator, through long experience, knows the amount of insulating material necessary and uses a piece about as shown at *F*. The upper part of the mold *C* is put in position, being guided by the pins *D*, and the completed mold is put in the press as at *E*. The press is of the toggle variety and forces the insulating material into the mold so as to hold the pole pieces and magnet firmly together. A space is provided for the magnet coils which are yet to go in place over the pole pieces. The mold also makes both the seat for the diaphragm and the thread by which the cap is screwed into place. It makes a particularly good thread too, which is the result of a combination of good die making and having a thoroughly suitable material as an insulator.

After a few preliminary operations the earpiece, in which the magnet and pole pieces are now firmly embedded, goes to the press, shown in Fig. 3. An earpiece body is shown in the hand of the operator and gives a better idea of the other end of the pole pieces than is obtained from Fig. 2. The ends of the pole pieces are slipped into the slots shown in the holder *A*, while the plunger *B* holds them firmly in place. The plunger is actuated by the toggle at *C*, the spring *D* being interposed to insure a uniform pressure against the block *A*. A movement of the foot now drives down the punch *E* and clips off the ends of both pole pieces to uniform length. This operation is necessary to insure the best

FIG. 2—MOLDING MAGNETS INTO EARPIECES



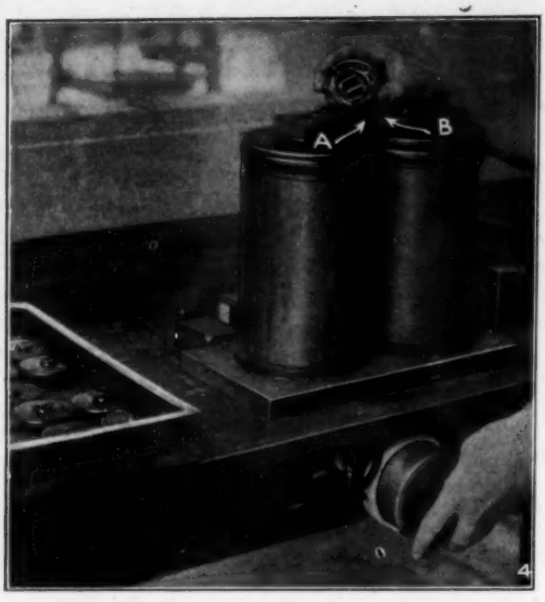


FIG. 3—TRIMMING ENDS OF POLE PIECES. FIG. 4—MAGNETIZING THE MAGNET

results and the length is carefully gaged. The important dimension is from the seat for the diaphragm to the ends of the pole pieces, the block *A* gaging it from the diaphragm seat inside the threaded rim.

The next step is to magnetize the magnet, through the pole pieces, by means of the powerful electromagnet shown in Fig. 4. Current is controlled by the switch just under the edge of the table and it only takes a momentary contact to charge the magnet. The ear piece is held so that each pole piece touches a pole piece of the electromagnet, at *A* and *B*. The magnet is then ready to receive the winding or coils.

The coils are wound on small, specially built machines, of which a battery is shown in Fig. 5. These machines have been developed and built by the Murdock company as a result of its experience in this line of work. The winding machines are run from a belt from beneath the bench, by means of a small line shaft which is motor driven. A form or hollow spool is made of two pieces of formed insulating paper as shown at *A*. Holding two of these pieces together with the raised edges outward forms them into a spool which is placed on the end of a winding spindle as at *B*. A turn of wire holds the two pieces together and the winding machine is then started by a treadle beneath the bench.

The wire is insulated by a coating of black enamel which is so thoroughly put on as not to crack in the bending and winding operations. This wire comes on spools which are mounted in frames as at *C*. The winding machine contains a counter (driven by a worm from the spindle and carrying a star wheel *D*) from which the count is easily taken. Two completed coils are shown at *E* and a box cover is fairly well filled with them at *F*. An earpiece with the two coils in place is also shown in front of the box cover.

The coils are then made up into pairs, the connecting ends of the wires soldered together, and the pair mounted over the pole pieces as in Fig. 6. The other ends of the wires are fastened to the terminals by which the coils are connected to the cords that plug in to the detecting and tuning apparatus. Electric soldering irons are used, owing to their great convenience for work of this kind.

Some idea of the extent of this business, due to the unprecedented demand for apparatus to "listen in" on the broadcasting stations all over the country, may be

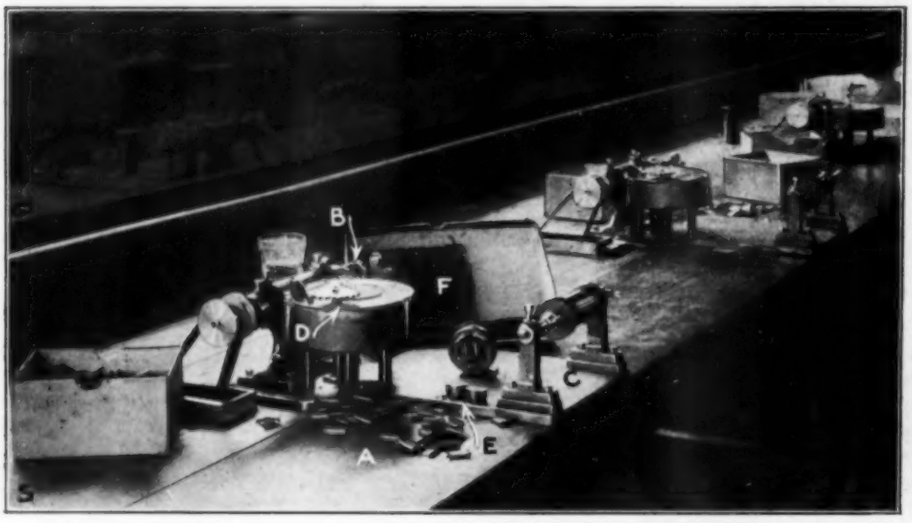


FIG. 5—WINDING THE MAGNET COILS. FIG. 6—PUTTING THE COILS IN PLACE

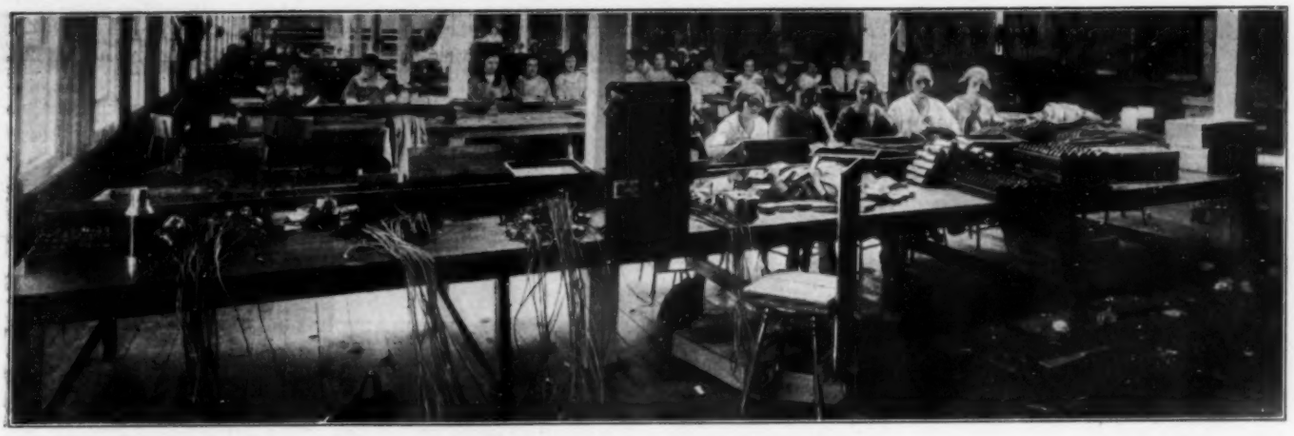


FIG. 7—ASSEMBLING THE HEADPIECES

had from Fig. 7, which is part of the assembling room for the completed head sets. This room is in the second story of a former electric railway repair shop and has only recently been taken over by the Murdock company in its endeavor to supply the demand for its instruments. This view shows the trays of head pieces, the assembling of the headpieces, the assembling of the flexible wires or "cords" which connect them to the receiving apparatus, and all but the head frames which hold the ear pieces in a fork and keep them in position over the ears of the listener. Even though this building is old, the lighting is remarkably good, the side windows having been supplemented by several skylights of liberal dimensions.

Leaving the headpieces we find an interesting die casting job in the making of the variable condenser used in "tuning" by some makers of receiving apparatus. The condensers consist of two series of thin metal plates, evenly spaced and so mounted that one set of plates can be swung between the other for any desiderd portion of their surfaces. There are two kinds of plates as shown at *A* and *B*, Fig. 8. The required number of *A* plates are assembled in a suitable mold or fixture which spaces them the right distance apart and the mold is placed in the die-casting machine as shown at *C* and held in position by the screw *D*.

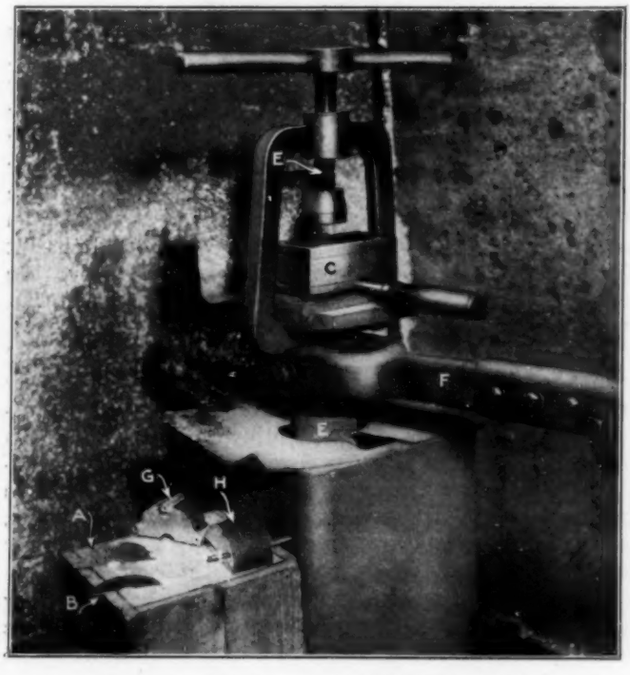


FIG. 8—DIE-CASTING CONDENSER PLATES

Below the frame is a pot of molten lead or type metal into which the plunger *E* reaches through a suitable opening. With the mold clamped in position over the opening in the table above the plunger, the lever *F* is brought down, forcing the metal up into the mold and casting it in position around the plates. Two completed sets of condenser plates are shown at *G* and *H*, the plates in *G* being held in three places and the ones in *H* only in the center. In use, the plates *G* are held stationary in the apparatus by three bolts while those at *H* are swung by means of the shaft shown so that they pass between the others. The method described is a simple and effective way of assembling the condenser plates and one that is proving very satisfactory.

Strikes and Walkouts

By R. Grimshaw

The chances are about ten to one that every factory will be visited some time or another with the strike fever. The visitation will be less likely, however, if the employees are educated to a few hard facts from labor sources. For instance, that (according to A. F. of L. figures) in 1919 there must have been collected in dues, $39,120,816, of which only $6,705,287 or about 17 per cent was paid out for union benefits (sickness, death, etc.), and only $1,391,833 or say 3.5 per cent for cost of strikes, leaving $31,623,696 or 79.5 per cent, for expenses of the unions.

It might also interest them to figure up how long it takes to make up from increased wages, even when a strike is successful, for the time when they were receiving from strike benefits only 3.5 per cent of their own money paid in as dues.

Put concretely, suppose men getting $50 a week strike for 10 per cent advance, and get it after two weeks' idleness. They lose $100 which divided by $5 gives 20 weeks before they are financially whole again. If they are out 10 weeks they lose $500 in wages, and it takes two years before the extra pay makes that up. In the meantime, instead of using all their savings to live on, they are getting only 3.5 per cent of what they had paid in, and this, no matter whether these $50 hands get $10 a week or $20 strike benefits. For every dollar that the average worker contributes to the unions, he gets back only 17 cents as sick benefits and 3.5 cents as strike pay.

Credit in the Machine Business

By H. B. Egg

It is important to know when credit should be asked for and when given, and for what purposes. In buying the daily commodities, you ordinarily exchange cash, which represents labor or other value, for something which represents labor and materials. There is no reason why the seller should wait for his money.

If you buy several objects every week or month from the same seller, the deliveries may occur at various times when it is not convenient to pay, and you can make arrangements to pay what you owe once a month, provided the seller has confidence in your willingness and ability. There is no law requiring that you be allowed thirty days, but you are given this time simply for convenience. If you want credit because you do not have the money today, you may likewise not have it thirty days hence.

Special Payment Methods

Special methods of payment are needed for articles made to order, because if the buyer fails, dies, or changes his mind before paying for the work done, the seller would suffer loss through inability to dispose of the special material. On all material made to order, including machinery, it is customary to make partial payment with the order, and often weekly or monthly payments thereafter.

Ignorance of the true uses and purposes of credit causes many young concerns to apply for credit on every purchase they make. Quite often they get it from merchants and manufacturers who ought to know better. Debts should not be incurred for the purchase of initial equipment, as a rule, because if the finances are that weak, there may not be enough cash to meet payrolls and current expenses. Sometimes it is permissible for new concerns to start under the handicap of a mortgage, but usually it is better not to. Lack of cash induces the temptation to pay thirty-day accounts in sixty or ninety days, and the business goes behind generally. Payments must be made eventually, and if they cannot be made when due, there is no especial reason why cash will be forthcoming in the hazy future, unless the firm is un-businesslike enough to permit its customers to take their own time in paying bills. If that is the case, then there is much trouble and anxiety in store.

Always Prompt Payers

If a new business is started off with enough cash to buy equipment, meet a few payrolls and other expenses, the men in charge should realize that there are plenty of prompt payers in the market without bothering with the slow or un-businesslike ones. Orders should be taken from the good payers; then it is simply a matter of keeping expenses below income to keep the business off the rocks. Competition is one of the most trifling worries in the machine business and causes a very small percentage of failures. On the other hand, slow collections and bad debts cause financial weakness.

It sometimes happens that special credit arrangements are desirable. For example, the company which employs the writer needed several machine tools to put through a large order. The business was small and lacked the necessary cash. We had never borrowed from the bank and did not know how to do it. (The machine industry is full of people just like that.) After a talk with the machine-tool builder, he found our business references and reputation satisfactory, and let us have the machines, to be paid for in six months, in six installments, without interest. His business was dull, or he might have charged us six per cent or have advised us to borrow from the bank. Long-time payments under such conditions, where everything is agreed upon in advance between both parties to the sale, are quite proper, and will not give a concern a bad name.

The size of a company has no bearing on its credit rating. Some of the smallest companies are "excellent pay," while some of the large ones are very slow and unsatisfactory. The way to build up a good credit reputation is to agree upon the terms of payment before the purchase is made, and then pay on time.

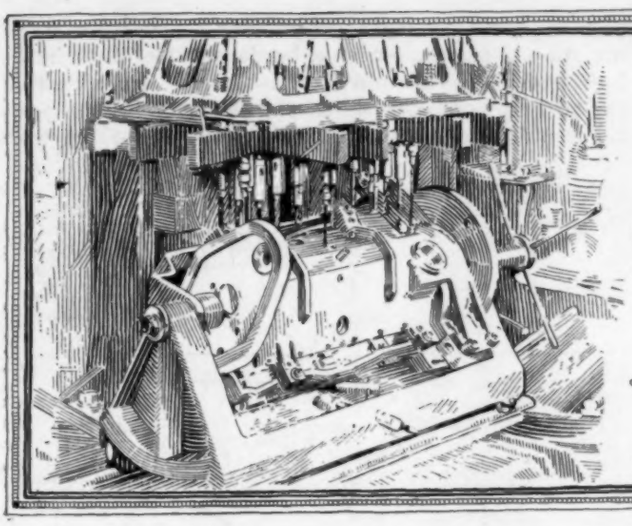
Many concerns will make purchases which should be paid for by cash upon delivery, but will ask for thirty days, knowing that they will need ninety days. The other day we received an order for some special turned and threaded shafting from a new customer. Our credit man asked for cash in advance. The customer informed him in a sarcastic manner that only one-horse concerns did business that way, and stated that they would pay in thirty days. On making inquiries from five supply houses which supplied this customer, we learned that he was very slow pay, running sixty to ninety days behind. We compromised by taking one-half cash with the order, and the balance on delivery of the material. When a customer asks for credit on a special material order, and has no account on your books, just keep the fact in mind that the payroll cannot wait thirty days or so.

Pick Customers

One time our company found itself in a peculiar condition, with all current bills paid, practically no cash in the bank, and a payroll to meet. Several thousands of dollars were owed to us on accounts. The business was over twenty-five years old, and a bank loan ought not to have been necessary. An investigation showed that about forty-five customers were in the habit of paying us when they got good and ready. Almost seven hundred others paid promptly. The few slow ones would not want it thought that they were dishonest or unbusinesslike, yet they forced us to pay the bank six per cent on money that they ought to have paid us. Of course we were at fault in allowing them to be so slow, but we were afraid that too strict an attitude would lose us trade. Then we learned that it is better to lose the order than to lose the money. An order can be gotten from some other customer, but when the money is lost, it is gone.

A new credit policy was adopted, as follows: Material made to order for customers who do not have monthly accounts, cash in advance. Sales from stock to customers who do not have monthly accounts, cash on delivery. Current sales to firms with high credit rating, thirty days net, where at least one purchase is made per month. Casual sales to firms out of the trade, cash on delivery. Any sale to customers who do not respect our thirty day terms, cash with order.

Since instituting this method, we have had very few complaints about cash payments, and the most strenuous objectors were almost without fail the ones with the worst business reputations.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Details of Design of Blanking Dies Continued — Standardization of Parts of Dies— Design of Guide Pins—Methods of Holding Punches

IT SEEMS desirable to bring up here the matter of standardization in dies, and point out its importance so that the designer will realize its utility and advantages. There are certain parts in all dies which remain the same and can be standardized. For example, the die shoe, die blank, stripper plate, punch plate, punch holder, liner pins and bushings. If these parts are designed correctly, a great many machining operations can be performed before the die opening is cut out of the blank. By using proper tools and gages these standardized parts can be produced in quantities on an interchangeable basis at much less cost than by machining one or two at a time when required. In addition to these points a new die can be made from standard parts in much less time than if the entire die must be made for each particular job.

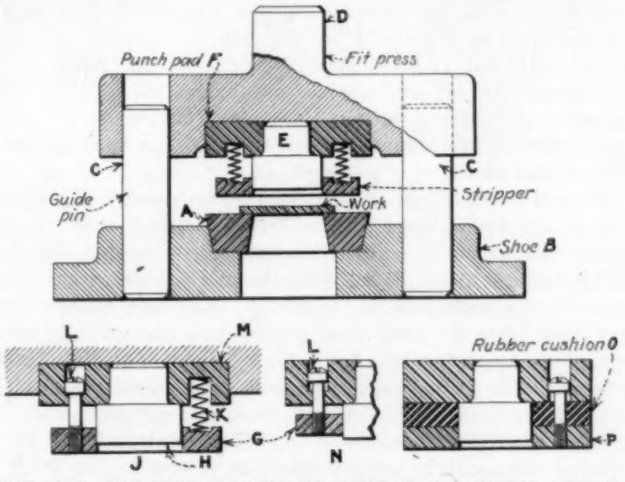
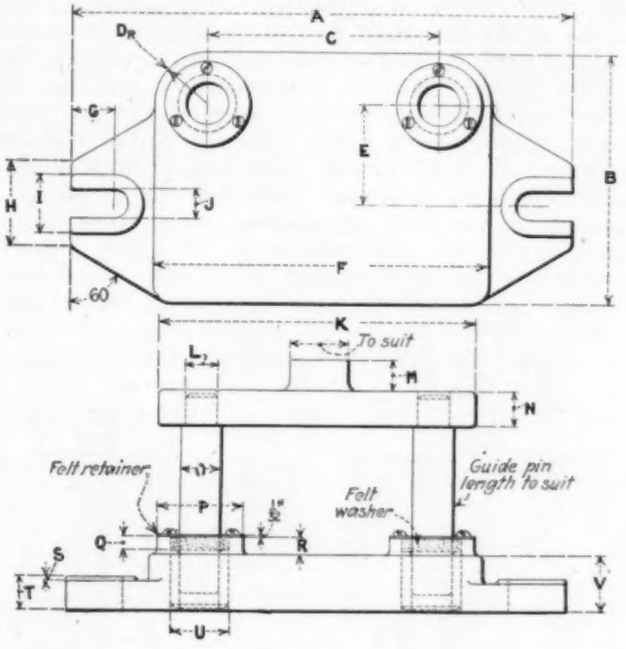


FIG. 456—DIE FOR LARGE BLANKING, SHOWING GUIDE PINS AND STRIPPER DESIGNS

Naturally, any company using punch presses covering a wide range would need to standardize their various units in accordance with the sizes of work to be produced and the presses used. The importance of this standardization cannot be over-emphasized, and its advantages are apparent to even a casual observer. A great many companies who use large quantities of dies yearly have found the process of standardization of the greatest value.

Blanking dies are frequently made with guide pins, as shown in Fig. 456. This particular design is generally used for heavy work. The die shown at *A* may be set into the shoe *B* in different ways, according to the shape of the work which is to be produced. In work of a circular form a recess can be cut in the shoe and the die forced into it, being suitably held by screws. There may be a slight taper on the sides of the die to insure concentricity, if desired. If the work is long



Shoe No. →	1	2	3	4
A	10	11	12¼	14
B	5	5½	7	10
C	4	5	6	7
D	1¼	1⅝	1⅞	1½

FIG. 457—STANDARDIZED DIE SHOES AND GUIDE PINS

For the authors' forthcoming book. All rights reserved.

or irregular in shape a slot can be cut in the shoe and the die fitted into it. In this type of die the guide pins shown at *C* align the punch and die so that they register correctly. The stem *D* fits the punch holder of the press.

It will be seen that the stripper used on this type of die is different from those which have been previously described. The punch *E* is mounted in a punch pad *F*, and the stripper remains with the punch instead of with the die. In the section shown at *J* the construction is clearly indicated. The stripper *G* is a sliding fit on the punch *H* and is forced downward by means of springs *K*. The movement is limited by the heads of the screws shown at *L*, which screws seat in the punch pad *M*. The diagram at *N* shows the position of the stripper *G* after the punch has entered the work, and it will be seen that the retaining screw *L* has moved upward in its pocket at this stage of the process.

A rubber cushion such as that shown at *O* is occasionally used in place of springs to act on the stripper *P*, but this is not generally as satisfactory as springs, although for certain classes of work the rubber cushion is used considerably. The disadvantage of it is that the rubber soon loses its elasticity under the constant pounding, so that the action of the stripper is not thoroughly efficient unless the rubber is frequently renewed.

When a die having guide pins is used it will be found profitable to standardize the sizes. Fig. 457 gives an excellent example of a method which can be used for standardizing such parts. In this case there are four die shoes, the general dimensions of which can be shown in a table placed on the drawing sheet. Additional dimensions can be given for various other parts of the die, but it has not been considered advisable to give them in the table shown at the bottom of the illustration. They can be varied according to the practice of different manufacturers. This type of die shoe and punch holder has been used considerably by the writers and has proven to be of excellent design. The guide pins in this case are fastened to the punch holder, details of which are illustrated in Fig. 458. There may be cases when it will be found necessary to change the location of the U-lugs, but the general design would not be affected, even if this were found advisable. The

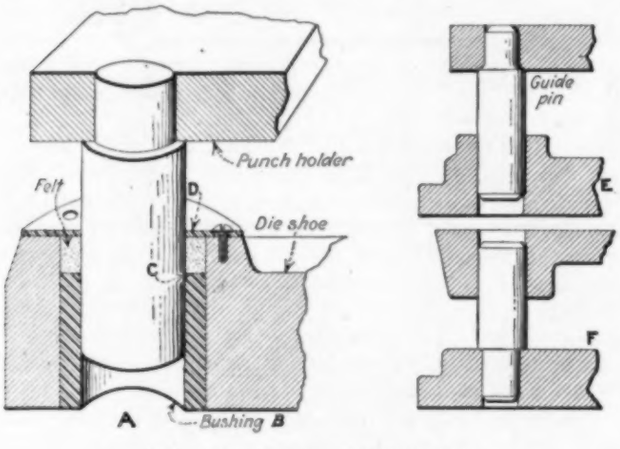


FIG. 458—GUIDE PIN DETAILS

length of the guide pins would be made to suit conditions.

Details of a guide pin, die shoe and punch holder are shown in Fig. 458. In the example at *A* the guide pin is fitted to the punch holder, and if necessary can be held in position by a setscrew or a dowel pin. The die shoe is provided with a hardened steel liner bushing *B* which has a radius at *C*. On the upper part of the bushing a felt washer is placed and is held in position by the steel washer *D*. The felt is saturated with

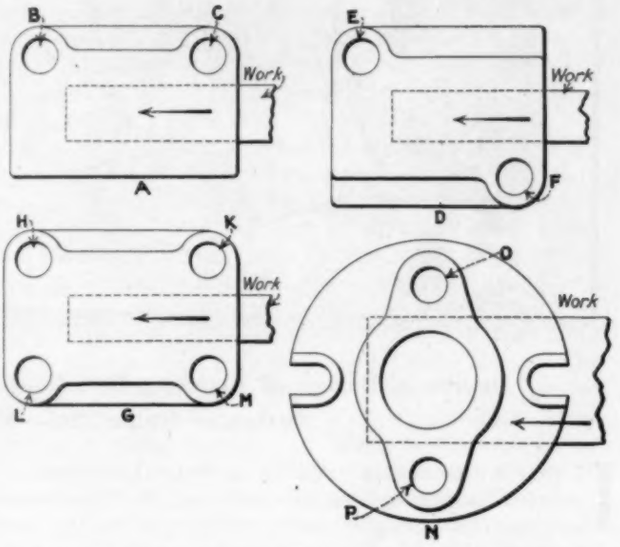


FIG. 459—STYLES OF DIE SHOES, SHOWING POSITION OF GUIDE PINS

oil, so that as the pin works up and down in the bushing it is always properly lubricated.

The use of bushings in die shoes is not always necessary, although the life and accuracy are greatly prolonged by their use. In high production work, bushings are recommended; but if the product being manufactured is produced in only small quantities the extra expenditure is not warranted, and the guide pins can be made to bear directly in the cast-iron shoes. Spiral or straight oil grooves should be cut in the guide pin to retain the oil and assist in lubrication. These oil grooves should not be deep, as their function is simply to gather and distribute the oil through the bushing, an important function nevertheless.

The position of guide pins has been a source of argument among designers; and some believe that it is better to place the pins in the punch holder, while others contend that it is better to place them in the die shoe. The examples at *E* and *F* illustrate these two methods, but as both are often used successfully we express no preference for either type. The function of the pin in either case is to provide an accurate guide so that the punch and die will register properly; and if proper provision is made so that chips and dirt will not tend to accumulate around the punch and in the bushing, there should be no difficulty experienced with either method.

There are a number of ways of arranging guide pins and several of the methods are shown in Fig. 459. In the example *A* two pins *B* and *C* are used at the rear of the die shoe. The direction which the work takes when passing through the die is indicated by the arrow. In the example shown at *D* there are two guide pins *E* and *F*, one at the front and one at the rear of the die shoe. The work passes between the pins as indicated. A die shoe is shown at *G* having four pins *H*, *K*, *L* and *M*, two of which are at the front and the other two at the rear of the die. Another example, shown at *N*, is quite different from those previously indicated. The

pins *O* and *P* are on opposite sides of the die and central with it. The die shoe itself is circular in form.

The example at *A* is considered best for medium sized work, as the front of the die is entirely open and it is therefore somewhat more convenient of operation.

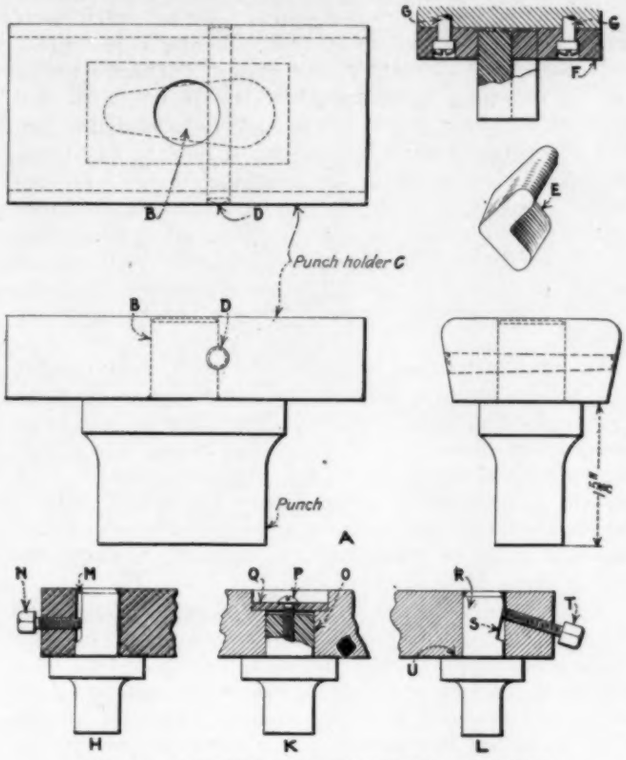


FIG. 460—METHODS OF HOLDING PUNCHES

The stock is more easily fed through and the pins are not in the way. The other styles are used from time to time, depending upon the class of work which is to be done and the size of the die.

Punch Holders

In a previous article we mentioned several general points in connection with punch holders, and we shall now take up some of the detailed matters connected with the design. Fig. 460 illustrates in detail several methods of holding punches in punch holders. In the example *A* the punch is fitted with a shank *B* which fits the punch holder *C*. As the shape of the punch is irregular, a tapered dowel pin D is used to hold it in position, and the punch drawn up against the under side of the punch holder and held in place firmly. The shape of the punch is clearly indicated by the dotted lines in the upper view.

It may be well to state here that punches for stock from $\frac{1}{16}$ in. to $\frac{1}{8}$ in. thick should not be less than $1\frac{1}{2}$ in. deep, as indicated in the diagram. When the work to be punched is thicker than $\frac{1}{8}$ in., the height should be correspondingly increased. For work less than $\frac{1}{16}$ in. thick, the depth of the punch can be decreased considerably according to the thickness of the stock. The purpose of using a long punch is to prolong the life of the tool and allow regrinding as it becomes dull..

Another irregular punch is shown in detail at *E*, and the method of fastening it is by using a holder *F* into which the punch is fitted as shown. This supplementary holder is screwed and doweled to the punch holder by screws shown at *G*. The upper end of the punch is left soft and the supplementary holder *F* is countersunk slightly, so that the punch can be peened over into the recess, thus holding it firmly.

In the diagram at *H*, *K* and *L* several other methods of holding punches are shown. In the example *H* a flat is machined on one side of the punch at *M*, and a plain setscrew *N* is used to hold it in position. In the example *K* the shank is turned cylindrical at *O* and tapped to receive the screw *P;* the washer *Q* acts as a retainer and prevents the punch from falling out. If this method is used for cylindrical punches no other provision is necessary, but if the punch is irregular a locating pin or dowel may be required. In the example *L* the shank *R* is milled away at one side, as shown at *S;* and the set-screw *T*, being placed at an angle, holds the punch in position and at the same time draws it up against the face *U*.

In Fig. 461 are shown several other methods which can be employed for holding punches. In the example *A* the punch *B* is quite similar to one which has been shown in the preceding illustration, except that it is considerably larger so that it requires a slightly different method of holding. It would be possible to slot the holder and make a corresponding tongue on the punch, as this would give a very excellent method of aligning. This example, however, is located on the face of the punch *C* by means of the dowels at *D* and *E* and it is held in place by the four screws at *F*, *G*, *H* and *K*. This gives a very substantial method of construction, and the punch is located with the necessary accuracy.

In another example, shown at *L*, the punch is of the form indicated so that it must be located accurately in relation to the die, yet its general shape makes it desirable to use a shank of cylindrical form as shown at *M*. In a case of this sort the location can be obtained by leaving the shank soft and placing a pin so that it acts as a key, as indicated at *N*. The same result can also be obtained by using a regular key, as at *O*.

In the example *P* a wire punch is shown that is supported in a holder *Q* into which it is driven. It is backed up by means of the adjusting screw *R*, which permits a certain amount of variation in the setting. This method is not recommended, except in cases where the thickness of the blank is less than $\frac{1}{32}$ in. Another

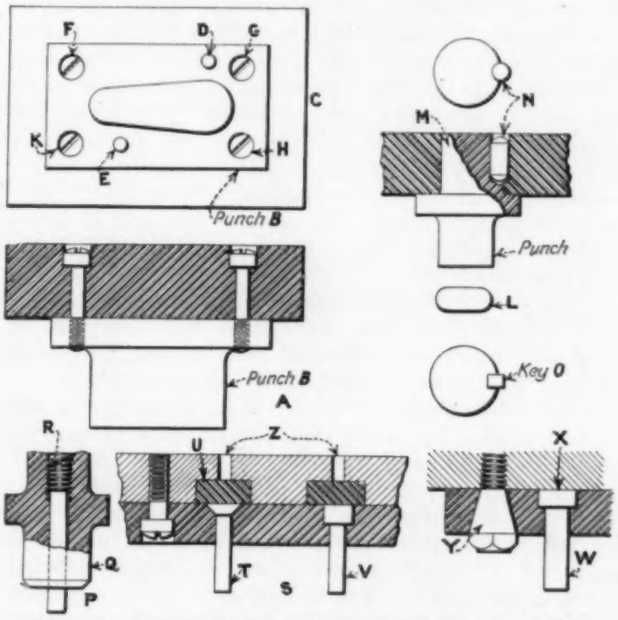


FIG. 461—OTHER METHODS OF HOLDING PUNCHES

method of holding two wire punches is shown at *S*. The punch *T* has a tapered head, and it is backed up by a steel disk shown at *U*. The other punch *V* is similar, except that the head is of larger diameter and straight instead of angular. It is backed up by a steel disk in the same manner as the first. A knock-out hole is provided at *Z* in each case.

The punch *W* is of similar form to that shown at *V*, but it is not backed up at all and comes against the cast-iron punch holder at *X*. The wear on the cast-iron holder will be so great that after the punch has been in use a short time it will lose its position and form a pocket in the punch holder, thus causing looseness and preventing accurate work. A condition of this kind might very easily result in breakage. The method of holding the punch holder is by means of a tapered screw *Y*, the taper acting as a dowel and the screw portion holding it in position.

How Stock Shortages May Be Eliminated

By R. C. Gifford
Superintendent of Production, Automatic Electric Company

High inventories and shortage of parts in assembly departments, with the resultant inefficiency, are difficulties which daily face the average factory manager. The more complicated the product, the greater the problem presented. A solution to the problem, however, has been found in the Chicago factory of the Automatic Electric Co., where 25,000 different parts are manufactured and 10,000 different raw materials used. Production meetings, which were formerly nightmares, have become a pleasure. No longer do the long list of stock shortages and the longer list of alibis take up the entire time of the meetings.

Some years ago, Henry Ford put an automobile on the market at a price that was thought to be lower than manufacturing cost. No one gave it much attention except to watch for the smash. Soon the price was lowered and manufacturers began to take notice. Another cut was made and they began to investigate. How was it done? Mr. Ford had standardized parts and also had attained large production. This standardization helped, but what was the most revolutionary of all his methods, he had mixed machine and assembling operations without discrimination. "Very well," said the wise manufacturer, "He can do that, but it would not work in our business. Besides, grandfather didn't do it that way."

When every other scheme we could think of failed to "kill the shorts," we thought of Mr. Ford. If he could mix machine operations and assembly benches, why not we? A careful study, however, revealed the fact that the chief offenders were not the standard parts used day after day, but were the specials used in varying quantities and intermittently.

It had been our plan in the past, as with most manufacturers, to group like operations together in one department. Thus, all punch press work was in a single group, all drilling in another, coil winding in a third, spring assemblies in a fourth, and so on. In this method, there is one and I may safely say, only one advantage. A minimum amount of expert supervision is required, and this benefit, in most cases has been allowed to overshadow the many disadvantages. The cost of the extra trucking and handling of parts from department to department often amounts to many times the saving in supervision. But most expensive of all losses is that due to delays in the assembly departments from a shortage of stock.

In desperation, rather than with any well defined assurance of success, we decided to experiment with Mr. Ford's scheme. Spool frames used in making magnet coils were chosen for the trial. The assembly work was done on small punch presses. A half-dozen such presses were installed in the coil winding department, and one of the diesetters was placed in charge under the coil winding foreman while the planning of the order of work was placed in the hands of the dispatcher who also planned the coil winding. From the day these presses started running, the shortage of spool frames ceased. Not only were the delays of the coil winding operators eliminated, but the inventory of spool frames was reduced over 50 per cent. This experiment was so successful that other punch press operations on parts used in this department were transferred with similar success.

An interesting case in connection with this transfer had to do with a very simple operation. A small U-shaped piece made from sheet brass was used in large and regular quantities of about 25,000 per day. This part appeared on the short list regularly about once a month. Investigation revealed that the punch and die for this work required repair at monthly intervals, and that the delay in repairing was sufficient to cause too long a break in production.

A duplicate and even a third set of tools did not stop the shortage of this part, but the reason for this was easily understood. The toolroom force was always busy and knew that one set of tools was being used, and so it let the repairs wait until all three sets were sent down. This operation was moved to the punch presses in the assembly department and the shortages ceased.

After several months, this part again appeared on the short-list at two meetings in succession. I made a quiet investigation to see if I could locate the cause of the trouble, since it seemed that our much talked of system was falling down. I found that without notice the job had been transferred back to the main press department a month before. It was again moved to the assembly department and the production meeting has not heard it mentioned since that time, over four years ago.

At first thought, there would seem to be no reason except gross mismanagement or negligence for the persistence of a case such as just outlined. In fact, I fought this problem for years with that idea in mind, continually raising the grade of employees until only technical college graduates were employed. Still the solution was not reached. But the answer now appears simple. The dispatcher or foreman, using the parts in question, knows their relative importance to his assembly department, and when the stock gets dangerously low he is in a position to bring the necessary pressure to bear to start the stock moving. On the other hand, if this same work was done by a department other than the one using it, the pressure was quite as likely to be exerted upon a part the stock for which was not so nearly exhausted, while the more important part was neglected.

Later it became necessary to enlarge the plant capacity and to rearrange all departments. The scheme here outlined was made the standard in the new layout, even where available floor space required placing the same class of assembled units in more than one department. However, two years of operation have proved it to be entirely successful.

President's Address to National Machine Tool Builders' Association

Machine Tool Builders at Fall Meeting Hear Statement of Problems Facing the Industry Evils of Price Cutting—Value of Accurate Cost Accounting

By August H. Tuechter

On June 12, 1902, the National Machine Tool Builders' Association was organized by 17 lathe builders. The first annual convention was held on Oct. 14, 1902, so that this convention marks the completion of our twentieth year as an organization. Of the 17 charter members only three have voluntarily resigned membership while continuing business. Three others have retired from the business and four gave up their membership through consolidations in which they have merged. This seems to me very good evidence that this Association must have meant something in all these years to those charter members who started it and who have stayed with it ever since.

Speaking for myself and my company I know that the Association has meant much to us since the day we joined it, that each year it has meant more than the year before, and as I vision the possibilities of associated effort, in each coming year this Association can and should mean increasingly more than any preceding year. You are all convinced of the cumulative value of advertising in building up the good-will factor of your businesses. I think the same cumulative value exists in associated effort.

Proper Competition

I look back to the days of cut-throat competition that existed prior to the formation of this Association, and I think of how much better things are today. All cut-throating, all unethical competition has not been removed by any means, for the strain of the last two years has revived some bad practices that we must seriously set about stamping out. But even though we have been going through, and are only just emerging from the worst slump the industry ever had, I am encouraged by noting how much rarer we have found these bad practices than they ever were before in less severe depressions.

Twenty years ago a printed price list was only the salesman's top limit in the vast majority of cases. Today this is true in very few cases indeed. That is itself a tremendous advance, but we still must work to eliminate the abuse of discriminating prices in the few cases where it still exists or where a backslide took place in ethics. Deviations from one's published price list are essentially unfair, and besides they hurt the very man who makes them. If you are quoted a confidential 5 per cent off a price list, you can never be certain that your competitor is not quoted a more confidential 10 per cent off. Any buyer buys with more confidence and respect from a seller whose price list means exactly what it says. Besides, this single price policy creates a good will and respect among competitors that is sure to improve competition.

The whole automobile industry works on a basis of openly published prices and there is no reason why ours should not. Nothing leads to reprisal and cut-throating as much as giving secret discounts and rebates; nothing gives the unscrupulous buyer a strangle hold on sellers, like the knowledge that an industry is shot through with such practices. On the other hand, nothing makes more for fair, honest, manly competition than openly announced prices that are not deviated from until replaced by other openly published prices.

An artist painting pictures not only gets his living from his efforts but he puts his heart in the work he is doing. The joy of accomplishment spurs him on. So with a constructive business man; his business is an art, and its successes satisfy his instinct of achievement, as well as furnish a means of livelihood. Just as musicians, painters, and sculptors in foregathering to discuss their art find their strongest friendships among their fellow craftsmen, it is equally true with business men.

Attitude Toward Competitors

I count it of just as much value to gain and hold the respect, the esteem, the friendship of my competitors as of my customers. Perhaps it is more valuable, because contact with a single customer is only occasional, while our competitors we have always with us. A single customer is met only "where is," but a competitor is met everywhere. The bad opinion of a single customer affects us adversely only in proportion to the size of his individual trade, but the bad opinion of a competitor hurts us everywhere.

Trade abuses are parasites that sap business of the life blood of profit. Abuses are rooted in envy and grow in hate of competitors. Only where the competitive soil is soured by suspicion can abuses take root and grow. Sweeten the soil by confidence and these noxious abuses wither and die, and the life blood of profit runs full and free. A healthy business is rooted in emulation, not envy, and it grows in respect and friendship of competitors, not in hate.

Is Friendly Co-operation Worth While?

How do we make friends? Only by being fair-minded, by being open and above-board in every way. Meet your competitor at least half way. Don't lie, don't cheat, don't slander his character or his product. Go out of your way to "do unto him as you would have him do unto you." Be generous with information. Cast your one bit of information on the waters and it will return to you a hundred fold, for a hundred others are doing the same with their bits of information. Enrich the soil of competition with respect for yourself, with friendship and fair play for your competitors, and you will reap a bountiful harvest.

An association can be worth while to its members only as the members put co-operation into it as well as dues. Not always have those who pay the highest dues contributed the most valuable ideas and suggestions. The Association's "Activities Chart" shows the variety of ways in which co-operation has benefited different members during the last two years. The bulletins sent out have covered a wide variety of information.

Without a central depository into which each member drops suggestions now and then, how could all this information be gathered and be made to benefit you by its variety and its careful competent presentation? Not a single bulletin has gone out but what some member or other commented on its helpfulness to him in solving some problem or in presenting some idea that had not occurred to him before.

Without an Association how could we eliminate illegitimate practices? On a single sale men have lost more than their year's dues because they took the word of a lying buyer as to a competitor's business methods. How could we strongly present the interests of the industry in matters of legislation? How could we do all the other things that modern business conditions force every industry to do by organized co-operation?

Is Our Association Practical?

Some members have resigned saying that the Association costs too much. Whether non-members realize it or not, this Association is working for their interest as well as the interest of its members, and from that aspect it is unfair for them to have the members carry the non-members' share of the industry's load as well as their own. Of course we cannot expect all men to be farsighted and realize the necessity of this work, so it remains for those who do realize its necessity to support this work and carry the "White Man's Burden." Only by education and demonstration can we hope to convert the others and get them to join with us in the work we must do for them as well as for ourselves.

Some, members and non-members, may think that the things we are proposing to do are day dreams, but I can assure you that our General Manager has not yet proposed any activity that he could not show to be in successful operation in some other association. Other industries have had more active associations than ours for many years. Our General Manager has kept in touch with as many of these as possible. He does not lack knowledge of what is worth while, nor ability to carry out any good activities that any other association has. He can and will make our Association as effective in every way as any other association. But he cannot go far if the membership do not co-operate and do not use the facilities of the Association.

The Association as a Constructive Influence

Essentially, every association is simply an information bureau. Nothing can be forced on members. They can merely be shown the facts and be asked to consider these facts in the management of their own business. When it comes to mopping up information our General Manager is a human sponge with unlimited capacity. But while he is soaking up all this information from all sorts of sources, all our members do not reach out their hands to squeeze the sponge and draw the information out of him. Those who do that know that it pays well.

Knowing what we have done and can do, I find it strange that some members do not use the Association to the fullest extent that they really can and should.

I take this occasion to record the progress to date of the broader activities that were begun at the time I entered upon the presidency. First there was the engagement of Scovell, Wellington & Co. to lay out the general principles to which the cost systems of our members should be brought to conform. This work was well done, and we have had many favorable comments on it. But unfortunately, the severity of the depression prevented us from getting much further than presentation and discussion of the report at a series of regional conferences and at the Cleveland Convention in February, 1921.

If we are now to have more active business our members should seriously set about getting their cost systems in line with the principles accepted, so that they will be better informed than they have ever been, when making prices. Only by so doing can you be sure to bring out the costs of idleness. These go on whether you directly set them forth or not. Only when you do know those idleness costs as they are can you determine which are unnecessary losses, and which are necessary costs of your business. When you actually have those costs of necessary idleness staring you out of countenance you will insist on getting a fair price for your product, one that will return those costs to you.

Unless these costs are recouped in price, this industry will stay on a low plane of remuneration unfair for all its participants, from apprentice boys up to presidents. Prices in the past have been based too much on mere hazy opinions of costs. There has been a general feeling that somehow or other we don't get out of our efforts the same reward that similar efforts bring to our neighbors and friends in other industries. If this is true, and I believe it is, it is because we have never had the facts of real costs so clearly before us as to permit of no dispute.

The Problem of Necessary Cost of Idleness

Facts are stubborn things, and convictions backed up by facts are a lot safer than hazy impressions as to costs. If you and your competitor both make unprofitable prices due to that sort of error in costs, you hurt the whole industry, and you owe it to yourselves to use better methods. Other industries find it profitable to spend much money and time on cost work, and our Association from now on should aim to do likewise. It is an investment, not an expense.

We are apt to think that the excess capacity in our industry, which has loomed so large and so idle during the last two years, is wholly a result of the war activity, but this is only partly true. The machine tool industry has always needed a maximum capacity considerably in excess of its average demand, taken over a period of years.

This is because our industry naturally suffers from what the electrical engineers term a "bad load factor" in electric light plants where a high peak load makes a large plant necessary, though the average load is low. The electrical people have given this load factor serious attention, and the peak load consumers pay rates in proportion to the expense of carrying idle equipment.

It appears to me that we could well give the same kind of consideration to the financial effect of our load factor on our pocketbooks. False bases for costs make false bases for prices. Too many of our industry use that method of dividing the total amount of expense incurred for a given period of the productive hours for that period, and calling the quotient their burden. This method has been sarcastically and truly described as a method of wasting money to give clerks simple exercise in long division to conceal costs.

Basing prices on such figures in boom times simply blinds one's eyes to the necessary cost of idleness in this industry, and leaves that cost out of the price of the product. It prevents the accumulation of a neces-

sary reserve to carry over the succeeding depression. It gives a false impression of profits during the peak load period; that makes stockholders hungry for fat dividends just when the cash should be kept in the business, and later on makes the stockholders blame the managers for weakness when receiverships occur.

That false method deludes managers in desperation during depression to sneak up back alleys with price-cutting bolos drawn on competitors who believe that honestly made goods are worth a fair price that carries a reasonable profit and should not be sold below cost. It also keeps the whole morale of the industry low; it destroys our self-respect; it prevents us from paying our employees what other industries will pay the same men; it makes our industry unattractive to the kind of men we ought to draw into it as engineers and salesmen; and it pays the industry's investors a smaller dividend than they can get on stocks bought in the open market whose earnings are not so fluctuating and whose stockholders do not run the same risks that ours do.

Frankness about Prices

If we now stamp out that kindergarten method of burden calculation, after the next boom we shall have less demoralization, and less worry. Let us openly tell the world about the demand fluctuations this industry encounters and why its bad load factor necessarily increases a burden rate to a figure much higher than one in a more stable industry. Let us study these things ourselves and see that our customers recognize these costs as necessary parts of price, and we shall have no difficulty in getting fair prices for our product. Unless we study these things our customers will not be convinced that the facts really exist.

The man who is ignorant of his true costs never has a firm basis for his price policy and can never command respect, either of his competitors or of his customers.

In the cycle we are now entering our members should so well revise their cost systems as to prevent their repeating the errors of the past. Regional accountants' meetings every three months would do wonders in that particular, and the results of such meetings would repay their cost many fold. I ask our incoming Board to well consider the advisability of such meetings.

Activities Respecting Amortization

Some buyers have put excessive pressure on our members because such buyers have a very different situation as to demand than our industry has. It is good work to make plain to all the world that we must operate our business according to the nature of its demand. Ours is a secondary demand that increases and decreases with demand for the products of our customers and is affected only slightly, if at all, by the price of our product. We all know that when our customers' shops are largely idle, no price above a free gift will induce them to buy tools that they have no reasonable prospect of using. We cannot stimulate our market when direct costs of building machines are lowered, that is, during years of depression. Our customers buy when active business requires more production, and when the buyer feels sure that a profit will inure to him out of the larger product of our machines. If and when a user cannot figure such a profit, whether times be good or bad, his ears are shut tight to the song of the machine tool salesman.

We could never gouge our customers if we tried, because they could all make machine tools in their own shops if our prices were so high that the cost and trouble would be less in making their own machines. The seller can never break through these natural limits to price that protect the buyer. Protected in this manner the buyers have never yet had to pay prices anywhere near the point where they would better make their own machines. The business struggle has gone on between the sellers, outside the buyers' breastworks rather than between buyers and sellers on the breastworks.

Even here sellers in their eagerness to reach the buyer have not protected their inventions with as many or as good patents as they could, and they have reduced their fair rewards by leaving themselves wide open to competitive attack, even though revolutionary inventions are rare in our industry. Because of the possibility of substitution of other means to produce the same results few tight patent monopolies have been possible.

Economic law protects our customers very well, but it heavily penalizes our own deficiencies. Due to all these things, very great profits have not been reaped by machine tool builders as compared to other industries, and perhaps never can be. But at least we should learn to avoid some mistakes that have reduced or even wiped out the naturally small profits that we could earn. It is constructive service to get our members to learn to make the best of a naturally bad situation. It is constructive work to make these things clear to potential competitors so that they will not rush into this industry in ignorance and make a naturally bad situation worse.

The Problem of Finance

I am convinced that if machine tool builders will pay more attention to the financial side of their business than they have in the past, they will be well repaid for the effort. Over-expansion of an industry beyond the actual requirements of its demand is almost entirely a problem for the element holding the financial control. When a man finds that by adding only a small part to his capital investment his costs per unit will be greatly reduced, it looks like a very simple problem in arithmetic to find additional profit.

The trouble is that about the time one man gets this bright idea the same very evident fact dawns on several others. They all expand, and if the total expansion is out of proportion to the market's requirements, it is very likely that a pressure to sell will arise that carries prices below the profit point and then the additional profit anticipated by the expansion vanishes into thin air and takes some of the previous profit with it.

The financial effect of excess capacity is to reduce the value of all the investment, not only in the concern that has the excess, but in the whole industry. Capital locked up in fixed investment is simply lost if it cannot be put to profitable use. A business is worth only what can be made out of it. If it cannot earn dividends on the investment, it is only worth salvage value.

The loss and gain problem in the final analysis is a problem of finance, and as it is the financial element that takes the risk and must always hold the purse-strings, it must therefore be the one to exercise the final responsibility. No business can afford to neglect this element and certainly no business subject to such irregularities as ours is safe in doing so.

Picking Them Out

BY ENTROPY

It is reported that several large firms will pick out their employees, big and little, by psychological tests as business resumes its upward tendency. Tests of one kind or another have been before the public for several years. They have been pretty consistently laughed at and yet they persist. The Edison questionnaires met more widespread ridicule, when they were first reported, than any other, presumably because of the fame of their author. But each succeeding test has sent more men scurrying for their encyclopædias to discover the answers and get ready to take a similar test if it should come their turn to do so. From these tests down to plain intelligence tests and trade tests of the simplest nature is only a moderate step and one that is very likely to follow.

It is pretty generally conceded, among employment managers, that selecting the right man for the job is comparatively easy as long as they can personally attend to it, but that, as soon as the plant needs men fast enough to keep several subordinates at work, there is no uniformity in their work. Consequently they would all like to discover some way to standardize the work so that all assistants in the hiring office will send about the same kind of men for each different kind of job. The general manager is concerned about this too because he realizes that he is not to have a perfect selection of men, no matter what his plan. He cannot expect to attract all the best machinists or pattern makers to his shop, realizing that others can play that game as well as he. He is better off with a fairly uniform selection if his tools, methods of manufacture and foremanship are adapted to that type than he will with a few high-grade men and some at the other extreme.

METHODS OF SELECTION

There are two ways of looking at the selection of men. One is to try to find the man best adapted by experience and training to go right ahead and do the work in the shop, while the other is to try to find the men who, when trained, will make the best men.

The first plan discovers the men whose experience comes the nearest to that which they will have in the new shop. It attracts the wanderers who, by virtue of much travel from shop to shop, can pass any kind of a trade test except a test for stability. It works well in a manufacturing machine shop where no great effort is made to keep men, where new men are wanted who will work for a while, leave all their good ideas for the superintendent to use, and, when their oranges are squeezed dry, will move on to some other place. They make for a high labor turnover but a low cost of replacement.

The second plan attracts young men whose ambitions are stirred by the promised chance to learn a trade or a profession. It is expensive in first cost because the cost of training is high regardless of whether it is concealed in the cost accounts or made the subject of a special ledger account of its own. It does produce a low labor turnover and undoubtedly in that way repays the first high cost as soon as it is running in full swing. Moreover, it makes a strong organization of men loyal to the shop, whereas the first plan makes a loose organization in which every man sees only a stepping stone to another job.

For the first plan, trade tests which show the technical skill of the applicant are all that is necessary. These tests, however, cannot be entirely verbal, the veriest manual training school boy could pass many of them verbally, but should be operative. The man should have certain jobs to set up and do before the eye of the examiner and he should be marked not alone on what he accomplishes but by the way he goes at it. For this purpose, it is essential that the examiner be broad minded enough to give the man full credit for successfully doing, in his own way, a job which he never saw before provided it is a workmanlike way and can be made efficient. Under the second scheme of tests, the intelligence test plays a great part, plus sufficient additional to show that the man has the special aptitudes that the trade requires. For example, the machinist trade is based very largely on ability to measure.

MUST DISTINGUISH MEASURES

A man on lathe, planer or milling machine works as close as he can measure and no closer. If the candidate shows inability to close a micrometer alike on two pieces of the same size he should be looked upon with question. If he cannot distinguish measurements with a rule as fine as 32ds he can hardly be expected to learn to read thousandths. Mathematical tests will also disclose the kind of men who can think in figures. Estimating tests, in which men are given short pieces of one, two and three inch bars to estimate without any means of measurement, will help, but the general intelligence test, with care to make sure of the man's general reasoning power and his imagination for things seen, gives the basis for a decision which will probably be at least as good as that of the employment manager himself.

The free use of tests is likely to bring about one condition that has not hitherto been met, except in connection with the civil service. Men will take many of these examinations with the idea of laying an anchor to windward. They may have no intention of accepting the job but they want to know how they stand. Men are just as curious, regarding their actual ability relative to others in the same line, as employers are. They may take a test at the Jones shop without the slightest thought of leaving Smith but if they rank high and an immediate job is available at a higher rate they are quite likely at least to ask Smith for more recognition in the pay envelope. This, however, is not an unmitigated blessing. If Smith finds several of his men making these shifts, he will jack up his psychometrist, or whatever he may call him, and get his tests up to the Jones standard.

Safety Appliances

BY C. E. JENSON

In many instances safety appliances are called for by law or ordinance. But the law is too seldom enforced. Some builders rather pride themselves on their machines and even tools being fool proof, but even after the law has demanded safety appliances for elevator hatches, gears, in fact, almost everything about the place, and the inspector has come around, which I am sorry to say is often only in the hopes of graft, danger areas and danger appliances still exist. It is up to the foreman to report them, over and over again if necessary, to his employer. No workman can reasonably be expected to give his best effort when he is constantly aware that his surroundings are unsafe.

Machining Gas Engine Pistons

Rough Turning in Automatic Machine—Trouble Due to Expansion Chuck Overcome by a Chuck of Special Design—A Special Grinding Mandrel

By A. W. FREEMAN

IN MACHINING pistons at the Cushman Motor Works, Lincoln, Neb., the castings are first annealed and the open ends faced by grinding on an 18-in. disk grinding-machine. The work is held by hand square against the disk, removing just enough stock to allow the piston to set flat on this surface, which is used as a clamping surface in subsequent operations.

Rough-reaming the open end is done on a Cincinnati-Bickford drilling machine, using a lathe chuck to hold the work, as shown in Fig. 1. Very little stock is removed, not more than $\frac{1}{32}$ in. For this operation we use an expansion shell reamer with a pilot at *A* approximately fitting the cored hole. The limits to which we hold this hole are plus or minus 0.0015 inches.

Rough-turning is done on a 2-in. Cleveland automatic piston machine, supplied with air equipment for operating the chuck, which is a distinctive feature in the operation. After an unsuccessful attempt to use a

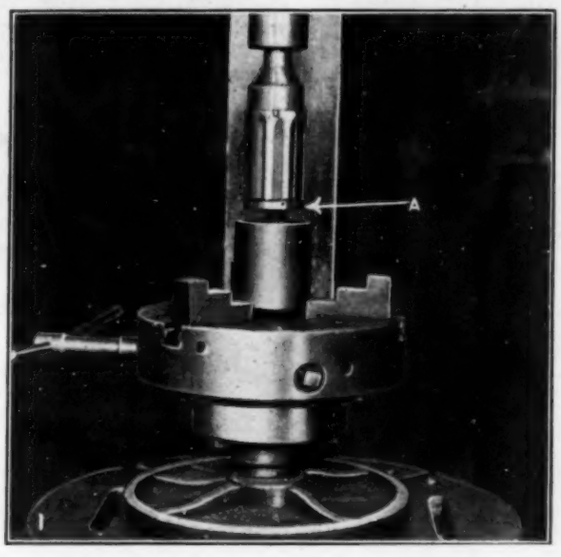


FIG. 1. ROUGH-REAMING THE OPEN END

chuck of the expansion pin type, the chuck shown in Fig. 2 was developed.

One trouble we had with the expansion type of chuck was that the pressure would crack the piston after the roughing cut was about completed. If we reduced the pressure, the piston would wobble or run out of true when the grooving tools started to cut. Worst of all the pistons would come out of round from 0.1010 to 0.050 in. These troubles have been overcome by using the chuck shown.

The chuck holds the piston the same as it would be held by a draw bar and pin through the wristpin hole, except that it grips over the outside of the wristpin bosses, thus eliminating the necessity of drilling the wristpin holes until after the piston has been finish-turned. It also ends the troublesome job of machining across the drilled holes in the turning operation.

To chuck a piston it is only necessary to slip it over the chuck and turn on the air. There is no outward pressure against the wall of the piston, all of the pull being straight back.

The two dogs *A* when spread by the spreader block *C* will grip the wristpin bosses. The spreader block and its rod *G* are connected direct to the piston rod of the chuck. Springs at *D* collapse the chuck when the air

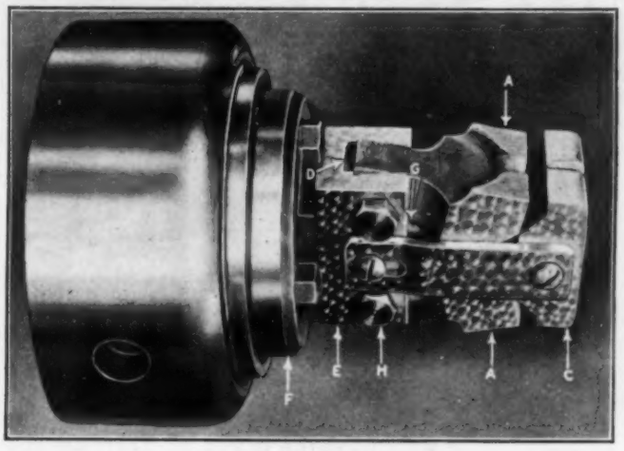


FIG. 2. A SPECIAL CHUCK

is released. The main member *E* has a heavy coil spring behind it to force it out when air is released.

When the air is turned on, the spreader block first spreads the boss dogs to their extreme position, catching over the wristpin bosses and then the whole chuck together with the piston is drawn back against the shoulder of mandrel *F*.

All of the pull is directly over the ends of the boss dogs *A*. The spreader block and rod have swivel joints, and the holes where bolts *H* go through are slotted to take care of any variation in the wristpin bosses, giving equal pressure on each boss.

A section of a piston slipped over the chuck is shown in Fig. 3 while Fig. 4 shows the piston tightened on the chuck. Note the difference in the positions of the boss dogs in each illustration. The wall of this piston is $\frac{1}{32}$ in. thick and the first operation, which includes rough-turning the diameter, roughing the ring grooves and facing the head end, leaves it to within 0.002 to 0.004 in. of round.

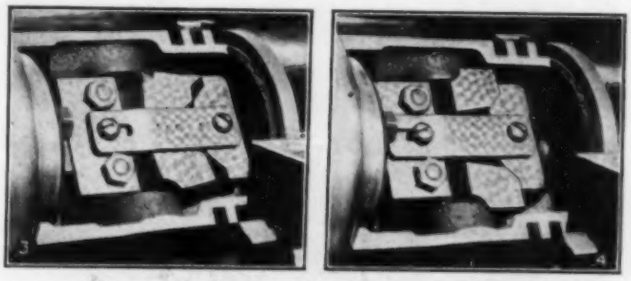


FIG. 3 PISTON IN PLACE, CHUCK NOT TIGHTENED.
FIG. 4. PISTON IN PLACE, CHUCK TIGHTENED

Boring and facing the open end is done on a No. 4 Warner & Swasey universal turret lathe. The work is held in a collet as shown in Fig. 5. The hole is bored with a two-bladed adjustable tool and reamed with an adjustable shell reamer. The diameter over the ring grooves is finish-turned with a second tool, allowing no stock for grinding.

In testing for leaks, the piston is placed in a fixture and a pressure of 50 lb. applied to the inside to determine if there are any leaks or porous places.

Boring the wristpin hole is done on a Cincinnati-

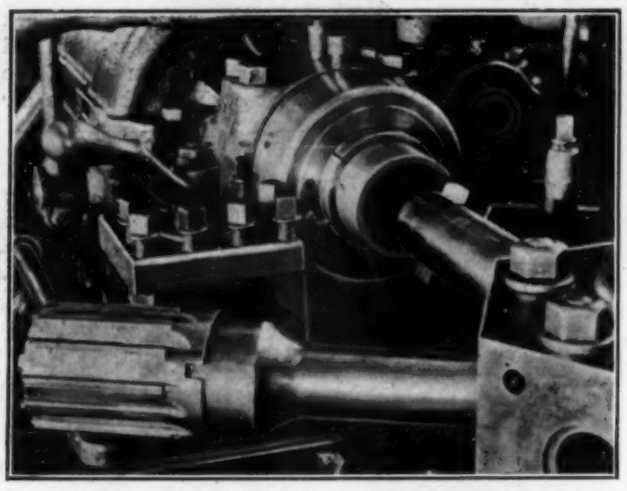


FIG. 5. BORING AND FACING THE OPEN END

Bickford 4-spindle gang drilling machine, using three spindles for the work as shown in Fig. 6. There are four fixtures. Three hold work in operation, leaving one ready to load. The hole is first drilled from both sides, turning the jig over to accomplish this. The fixture is then passed along the track to the next spindle and rough-reamed in the same manner. The finish reamer in the third spindle, however, is run through both holes from one side to insure perfect alignment. The holes are reamed to within 0.005 to 0.0015 in. of finished size. This amount is removed by hand reaming when the wristpins are fitted. Two gages are used, a limit gage and a gage to check alignment of holes. The illustration shows the locating arrangement. The yoke *A* straddles one wristpin boss. The plate *B* is hardened and ground and has a pilot to fit the open end of the piston. Screw *C* holds the piston squarely against the plate and over the pilot.

In finish grinding the diameter, the work is placed on the hardened and ground mandrel shown in Fig. 7.

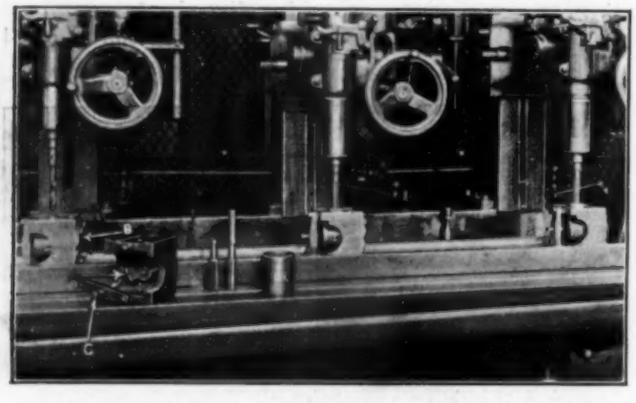


FIG. 6. DRILLING AND REAMING THE PIN HOLE

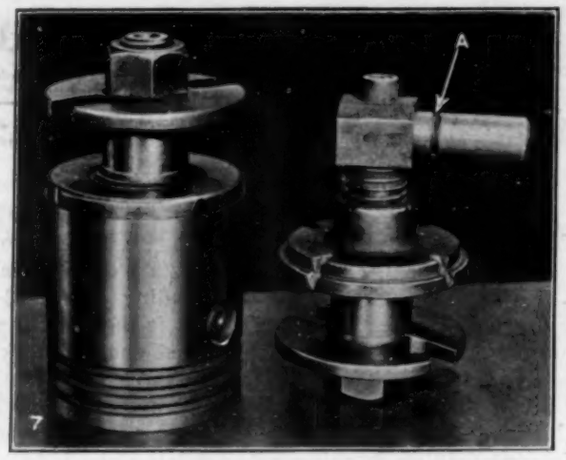
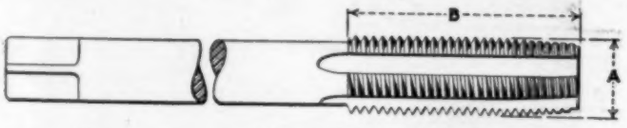


FIG. 7. MANDREL FOR HOLDING PISTON IN GRINDING MACHINE

The groove to be seen in the center of the pin at *A* is used to hold it centrally. A small ball with a spring behind it drops into the groove when the pin is in position. The four grooves shown in the mandrel will allow the grinding compound to run out. To remove the piston from the mandrel, the nut is clamped in a vise and it is only necessary to grip the piston by the hands to tighten or loosen it. A Norton 20 x 2½-in. 36-L Crystolon wheel is used, removing 0.008 to 0.012 in. of stock while feeding straight in and finishing in one operation to 3.247 or 3.245 inches.

Dimensions of Tapper Taps

The accompanying table gives dimensions of tapper taps as recently adopted by the Tap and Die Institute. It is published for the information of those interested.



DIMENSIONS OF TAPPER TAPS AS ADOPTED BY THE TAP AND DIE INSTITUTE

Diam. of Tap, Inches A	Length Overall, Inches,	No. of Threads, Per Inch			Length of a Thread Inches, B	
		U.S. Std.	S.A.E. Std.	Whit. Std.	U. S. Std. Whit. Std.	S.A.E. Std.
1/4	12 and 15	20	28	20	1 5/8	1 1/4
5/16	12 and 15	18	24	18	1 13/16	1 3/8
3/8	12 and 15	16	24	16	2	1 1/2
7/16	12 and 15	14	20	14	2 1/4	1 11/16
1/2	12 and 15	13	20	12	2 1/4	1 11/16
9/16	12 and 15	12	18	12	2 1/2	1 7/8
5/8	12 and 15	11	18	11	2 1/2	1 7/8
11/16	12 and 15	11	16	11	2 1/2	1 7/8
3/4	12 and 15	10	16	10	2 3/4	2
13/16	12 and 15	10	....	10	2 3/4	.....
7/8	12 and 15	9	14, 18	9	3	2
15/16	12 and 15	9	....	9	3	.....
1	12 and 15	8	14	8	3 1/2	2 5/8
1 1/8	15	7	12	7	3 1/2	2 5/8
1 1/4	15	7	12	7	3 1/2	2 5/8
1 3/8	15	6	12	6	4	3
1 1/2	15	6	12	6	4	3
1 5/8	15	5 1/2	....	5	4	.....
1 3/4	15	5	....	5	4 1/2	.....
1 7/8	15	5	....	4 1/2	4 1/2	.....
2	15	4 1/2	....	4 1/2	4 1/2	.....

Ideas from Practical Men

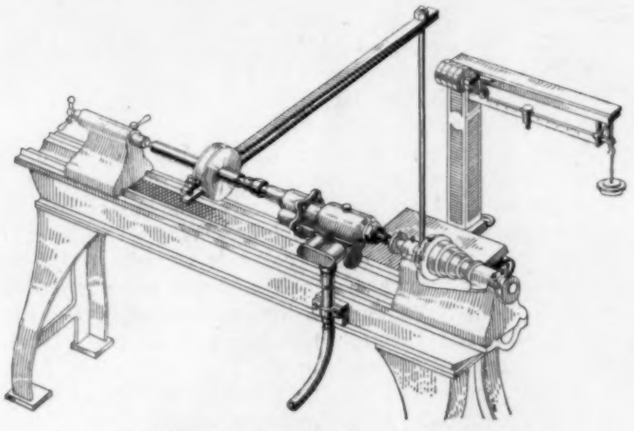
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Simple Device for Testing Power of Air Drill

BY JUVENAL GRIGNOLO

On pages 875 and 951, Vol. 56, of *American Machinist*, S. Ashton Hand describes devices for testing the efficiency of air drills. These suggestions are all right for the purpose provided there are a sufficient number of drills in operation around the plant to warrant the expense of the installation. The sketch accompanying this article shows a device used by the writer while repairing drills around a small shipyard that has at least the merit of low cost.

A short shaft was made with a tapered shank to fit the socket of the drill and to it was keyed a flanged pul-



DEVICE FOR TESTING AIR DRILLS

ley, or brake wheel, about 8 in. in diameter. A forged brake band was made, as the sketch shows, and was lined with leather to fit the brake wheel. To test a drill, the shaft and brake wheel should be put into the drill and the whole placed between the centers of a lathe. The brake band should then be separated and placed over the wheel, being then drawn tight by means of the bolt at the short end. When in position, the long end of the brake band lever extended horizontally over the front shears of the lathe and was supported in this position by a long rod, the lower end of which rested upon the platform of a scale placed in front of the lathe.

Turning on the air and tightening the bolt gradually, at the same time increasing the weight on the scale beam to correspond, the resistance necessary at the end of the lever to stall the drill was thus determined in terms of weight. This device would not, of course, measure the efficiency of the drill in the matter of air consumption with respect to the amount of work done but it does measure the power a drill was capable of delivering and tells us immediately whether or not a repair drill is up to the standard. This is the really important matter.

Another Way to Catch the Thread—Discussion

BY JESSE B. KING

In an article on pages 352 of the *American Machinist*, Vol. 57, under the above title, H. O. Turnbull gives a scheme for catching the thread with a pointer. The idea is very good, but I dont think Mr. Turnbull carried it quite far enough. He neglected to tell us what would happen should the thread extend up close to a flange or shoulder, in which case his thread pointer would receive some rough usage as it is in advance of the thread tool.

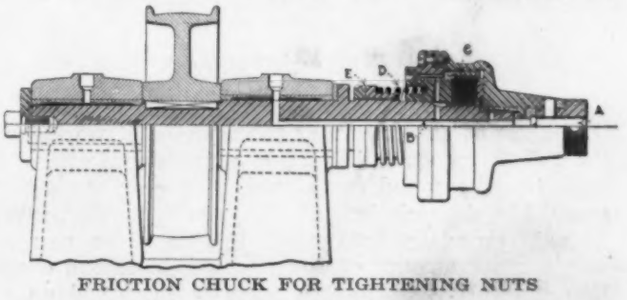
I had a similar device in use at one time on a lathe minus a thread dial and, as the work was of 1⅞ in. diameter and to be threaded close up to a 4-in. flange, the rigid pointer would not do. I hit upon the scheme of hinging the pointer about ⅜ in. from the tool post. When the operator is sure the tool will follow correctly, he can swing the pointer up where it will not cause trouble and set it down again before starting the next cut.

Friction Chuck for Tightening Nuts

BY HERBERT CRAWFORD

The illustration shows a friction chuck used by the Ford Motor Co. for screwing up nuts to any desired tightness. Without going into unnecessary details of construction, it will be seen that the device consists primarily of the chuck *A* and the driving spindle *B*. These members are connected by the friction plates *C* in the same way as the friction clutches in automobile drives. Part of the disks are connected to *A* and the remaining disks to the drive shaft *B*, normal friction being secured by means of the helical spring *D*.

This friction can be readily adjusted by means of the nut and lock nut shown at *E*, the drawing showing very



FRICTION CHUCK FOR TIGHTENING NUTS

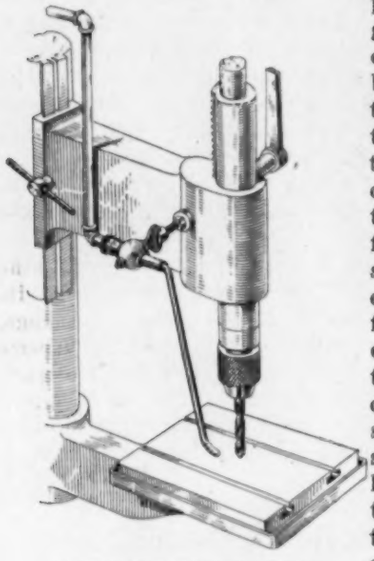
clearly the construction of the whole chuck. Although the chuck is shown on the end of a spindle mounted in a bench stand, the same design of chuck is used on the end of the flexible shaft when it is desired to tighten nuts in assembling units which can be handled more readily by bringing the chuck to the work. This device is designed for tightening small nuts.

Automatic Air Valve to Blow Away the Chips

By W. L. Kaufman

On small drill-presses used in connection with manufacturing operations, we found that it took altogether too much of the operator's time to keep the chips away from the table or fixture where the work was to go. Each time a piece was changed it would be necessary to brush or blow away the chips to make sure that none of them would get under the following piece and cause it to be drilled incorrectly.

To remedy this difficulty we piped air at 60 lb. pressure to each of the drill-presses and closed each pipe with an ordinary gas cock from the plug of which the pin had been removed so that the plug would turn all the way around. We then tapped into the end of the pinion shaft of the drill-press a large fillister head screw, the slot of which had been enlarged sufficiently to fit over the thumb piece of the gas plug and attached it to the plug by drilling through and setting in a pin, as shown in the sketch. A lock nut on the body of the screw kept it from turning in the thread and gave us an adjustment in the matter of the angle at which the slot stood. A small copper tube was fitted to the outlet end of the gas cock and bent down close to the table or fixture where the jet of air would do the most good.



AUTOMATIC AIR JET FOR SMALL DRILL-PRESS

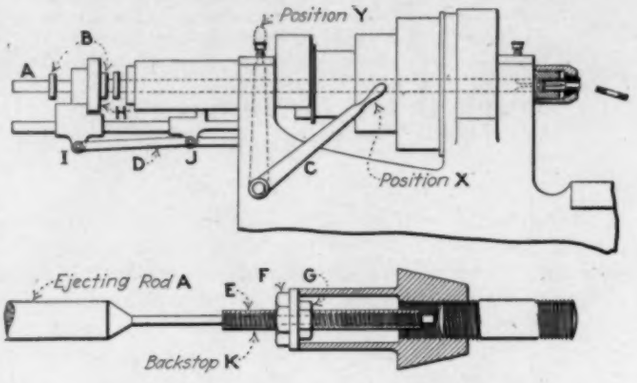
With a drill-press equipped in this way, the operator need pay no attention to the chips. When he starts to raise the drill from the work the air will automatically be turned on, while, if the lever is thrown away back, as when changing pieces, the air will be shut off again. By loosening the lock nut on the body of the screw, the valve can be set in position to deliver a jet of air at any desired rise of the drill.

A Backstop and Ejector Combination

By M. W. Taylor

The use of an ejector for the removal of work from the collets on small hand screw machines, when figured in dollars and cents, will in a year more than cover the depreciation of the machines themselves. This is especially true when the operation requires only a small amount of time, such as a second operation on work that has been partly machined on an automatic. For example, if a stud requires a ten-second threading operation (the opposite end having been previously threaded) and the time required to remove the work from the chuck is two seconds, the use of an ejector means a saving of 20 per cent of the total time. Obviously, the shorter the machining operation, the greater the saving.

The type of combination backstop and ejector illustrated in the accompanying sketch has a wider range than the so-called "spring type," generally used on the hand screw machines as there is no sticking of the spring to contend with. An adjustable backstop *K*, an ejector rod *A*, two feeding collars *B* and connecting



COMBINED BACKSTOP AND EJECTOR

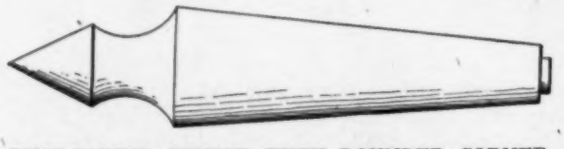
strap *D* are necessary. The backstop and collars are equipment to be found in practically any shop. Stud *E* is a piece of steel tubing threaded and the stop can be adjusted to the length desired by moving the nuts *F* and *G*. The ejector rod is made of cold-rolled steel with one of the ends turned down so as to make it a sliding fit in the hole in the backstop. The feeding collars *B* are adjusted with setscrews.

When the lever *C* is in position *X*, the collet is open. The piece of work is placed in the chuck until it touches the backstop and further movement causes the ejector to slide back in the hole. When the lever *C* is moved to position *Y*, the collet is closed. After the operation has been performed, and the lever moved to open the collet, the simultaneous movement of *H* starts the ejector rod through the backstop and ejects the work instantly. Connecting strap *D*, secured at *I* and *J*, causes movement of *H* in the direction in which lever *C* is moved. Casehardening of all parts adds to the life of the apparatus.

Saving Time in Grinding Centers —Discussion

By A. Chester

Charles Kaufmann's suggestion for a center to save time in grinding, published on page 234 of the *American Machinist*, is a very good one but there must either have been a mistake in the sketch or Mr. Kaufmann overlooked the fact that a sharp corner is not usually con-



TIME-SAVING CENTER WITH ROUNDED CORNER

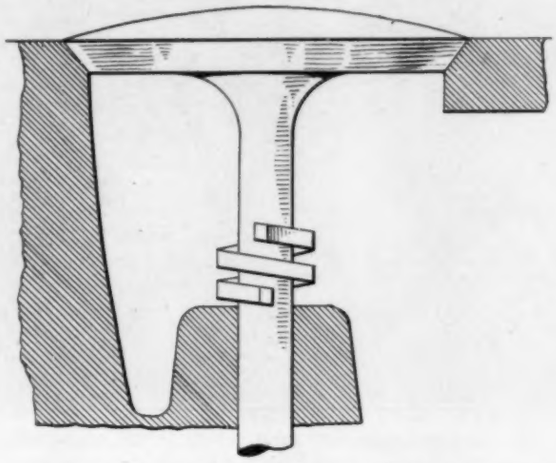
sidered good design. The same idea, but with a generous round, as shown in the sketch herewith, would be much more in accordance with the general conception of good mechanical practice. Moreover, it certainly would save a lot of trouble in trying to harden such pieces.

Rings to Keep Valves from Sticking

BY G. A. LUERS

Valves sticking, due to carbon collecting about the stems, is a common fault in some motors. It is necessary in some cases to remove the cylinder head and disassemble the parts to scrape the carbon from the stems. One motorist devised the simple method for scraping off the carbon as rapidly as it collects, by placing a scraper ring about the stem of each valve, as indicated in the sketch.

These rings are made from heavy square wire wound to about the size of the stems and cut off to leave two



RINGS TO KEEP VALVES FROM STICKING

turns in each ring. Another method is to use one or more lock washers about the size of the valve stem, which will effect the same purpose. The movement of the valve affords the loose ring an opportunity to reach the bearing surface each time the valve raises. Since installing these rings the owner claims not to have had a reoccurrence of valve-sticking troubles.

Slip Bushings

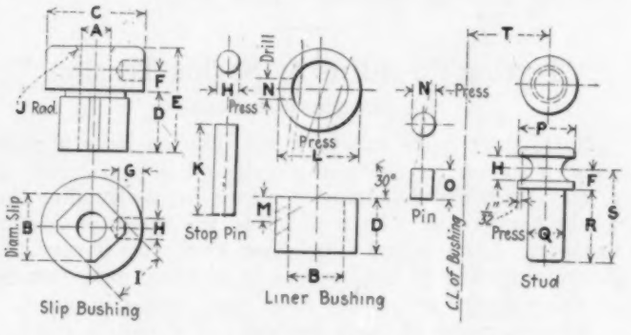
BY EDWARD HELLER

The slip bushings described by Raymond Beckman on page 152, Vol. 57, of *American Machinist* are certainly a step away from the ordinary kind and there are quite a few objections to be raised against them. In the first place, they are rather expensive to make. Secondly, the handle is pretty large (the smallest one is 2½ in. spread) and at times other things around the jig would interfere with it. Lastly, the chief objection to slip bushings, that of sticking, is not eliminated. Mr. Beckman only provides a big handle with which to pry them loose.

A slip bushing that does away with the chief trouble is shown in the accompanying drawing. The principal feature of the bushing is the relief milled on the part that enters the liner bushing. No matter how much dirt or grease there is in the liner bushing, the slip bushing acts as a reamer and cleans everything out. Another feature of this bushing outfit is the method by which the liner bushing is held in place. A small hole is drilled in the liner bushing a distance *M* from the top and at 30 deg. with the horizontal. After the bushing is pressed into the jig body, the small hole *N* is continued through the liner bushing, into the casting of the jig. A small pin is then forced into the hole. The hole for the pin is always drilled deeper than necessary.

If for any reason it becomes necessary to remove the liner bushing, the pin can be driven in deep enough to clear the bushing, which can then be forced out. When another bushing is inserted, it is set to miss the old hole, and a new hole is drilled for the pin. It is not often that a liner bushing has to be replaced, so the extra holes that might have to be drilled in the jig casting are negligible. This method does away with a flange on the liner bushing and it also permits the bushing to be driven in or out in any direction.

These bushings were developed and used in a shop manufacturing automobile motors and transmissions. The sizes shown in the table are the principal sizes used up to one inch. For any intermediate sizes, the dimen-



A SLIP BUSHING THAT WILL NOT STICK

sions of the next larger size were used. The parts for the more common sizes were usually made in quantities, kept in stock and when a drill jig was designed the bushings and accessories were drawn in but no dimensions given. The parts were then called for in the bill of material. It will be interesting to note that we even designed a universal drill jig to drill that little hole in the liner bushing.

SIZES OF BUSHINGS AND PARTS

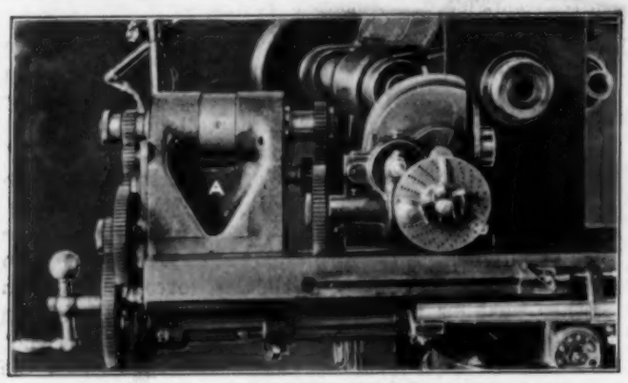
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1/16	3/16	3/8	1/2	3/4	1/8	3/32	1/16	11/64	1/32	7/16	3/8	3/32	1/16	3/16	1/4	3/16	3/8	5/8	15/32
3/32	1/4	3/8	1/2	3/4	1/8	1/8	1/16	7/32	1/32	7/16	7/16	1/8	3/32	3/16	1/4	3/16	3/8	5/8	7/16
1/8	5/16	7/16	5/8	7/8	1/8	1/8	1/16	9/32	1/32	1/2	1/2	5/32	3/32	3/16	1/4	3/16	3/8	5/8	17/32
5/32	3/8	7/16	5/8	7/8	1/8	1/8	1/16	11/32	1/32	1/2	9/16	3/16	3/32	7/32	1/4	3/16	3/8	5/8	17/32
3/16	3/8	9/16	5/8	7/8	1/8	1/8	3/32	11/32	3/64	5/8	9/16	7/32	3/32	7/32	5/16	1/4	15/32	23/32	23/32
1/4	1/2	3/4	5/8	7/8	1/8	1/8	3/32	13/32	3/64	3/4	11/16	1/4	3/32	7/32	5/16	1/4	15/32	23/32	15/16
5/16	9/16	13/16	5/8	15/16	5/32	3/16	1/8	15/32	1/16	13/16	13/16	1/4	1/8	7/32	3/8	5/16	15/32	25/32	31/32
3/8	11/16	7/8	3/4	1 1/8	3/16	3/16	1/8	19/32	1/16	13/16	15/16	1/4	1/8	1/4	3/8	5/16	1/2	7/8	1
7/16	3/4	15/16	13/16	1 3/16	3/16	3/16	1/8	21/32	1/16	13/16	1	1/4	1/8	1/4	3/8	5/16	1/2	7/8	1 1/32
1/2	27/32	1	7/8	1 5/16	7/32	3/16	1/8	11/16	3/32	13/16	1 3/32	1/4	1/8	1/4	3/8	5/16	1/2	15/16	1 1/16
9/16	29/32	1 1/8	1	1 1/2	1/4	7/32	1/8	25/32	3/32	13/16	1 5/32	9/32	1/8	1/4	3/8	5/16	1/2	1	1 3/32
5/8	1	1 1/4	1 1/8	1 5/8	1/4	7/32	1/8	27/32	3/32	13/16	1 3/8	9/32	1/8	5/16	3/8	5/16	1/2	1	1 5/32
11/16	1 1/16	1 5/16	1 1/8	1 5/8	1/4	1/4	1/8	29/32	3/32	7/8	1 7/16	5/16	1/8	5/16	3/8	5/16	1/2	1	1 3/16
3/4	1 1/8	1 3/8	1 1/8	1 5/8	1/4	1/4	5/32	31/32	1/8	7/8	1 1/2	5/16	1/8	5/16	7/16	3/8	17/32	1 1/32	1 7/32
13/16	1 1/4	1 1/2	1 1/4	1 7/8	5/16	1/4	5/32	1 3/32	1/8	7/8	1 5/8	5/16	1/8	5/16	7/16	3/8	17/32	1 5/32	1 9/32
7/8	1 5/16	1 9/16	1 1/4	1 7/8	5/16	1/4	5/32	1 1/8	5/32	7/8	1 11/16	5/16	1/8	5/16	7/16	3/8	9/16	1 3/16	1 5/16
15/16	1 3/8	1 5/8	1 3/8	2 1/8	3/8	1/4	5/32	1 3/16	5/32	7/8	1 3/4	5/16	1/8	5/16	7/16	3/8	9/16	1 5/16	1 11/32
1	1 3/8	1 5/8	1 3/8	2 1/8	3/8	1/4	5/32	1 3/16	5/32	7/8	1 3/4	5/16	1/8	5/16	7/16	3/8	9/16	1 5/16	1 11/32

Cutting Spirals of Extreme Lead

By A. B. Seaman

At times it is necessary to cut spirals having leads beyond the range provided for by the gearing of the universal milling machine.

The accompanying illustration shows a device *A* in use at the works of the Pratt & Whitney Co., Hartford,



DEVICE FOR CUTTING SPIRALS OF EXTREME LEAD

Conn., by which the range in the leads of spirals that can be cut with the regular gears can be increased or decreased by as much as ten.

As can be seen, the device is simply an arrangement for compounding the gears between the driving gear on the table screw and the driven gear on the worm of the dividing head, behind which it is placed.

Testing Push Fits by Spring Tension

By Herbert Crawford

Nothing is more exasperating than to have a gear come loose on its shaft, especially when it is part of a gear train and repairing it means dis-assembling the whole gear train. To avoid this the Neptune Meter Company, Long Island City, New York, has a very ingenious method of testing the fit of small gear wheels on their shafts, after they have been forced in place.

Two examples of their method are shown in Figs. 1 and 2. In Fig. 1 the wheel shaft is clamped in the quick acting vise *A* by the lever shown. Then the two prongs *B* of the tool *C* are placed between the spokes of the wheel and the tool turned until the screw *D* touches the other end of the slot. The two parts of the tool are connected by a helical spring. This puts the desired spring tension on the wheel, and if it does not turn on the shaft, it will stand any load that will be thrown on it in the gear train.

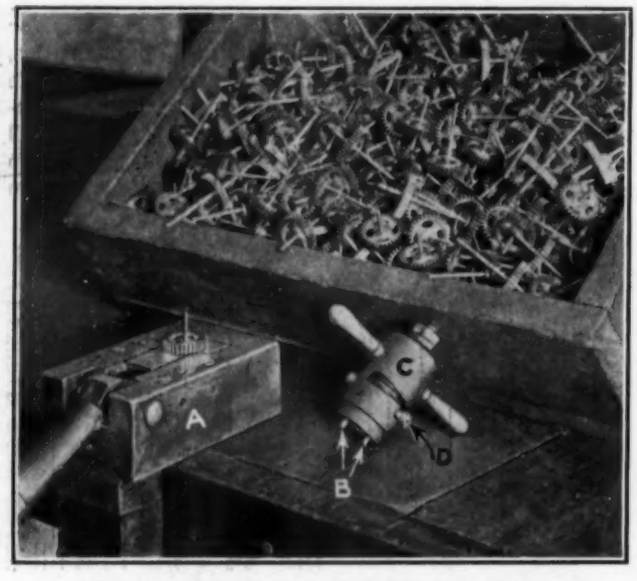


FIG. 1—TESTING FIT OF WHEEL ON SHAFT

Another method of doing the same thing is shown in Fig. 2, except that this method tests the wheel on

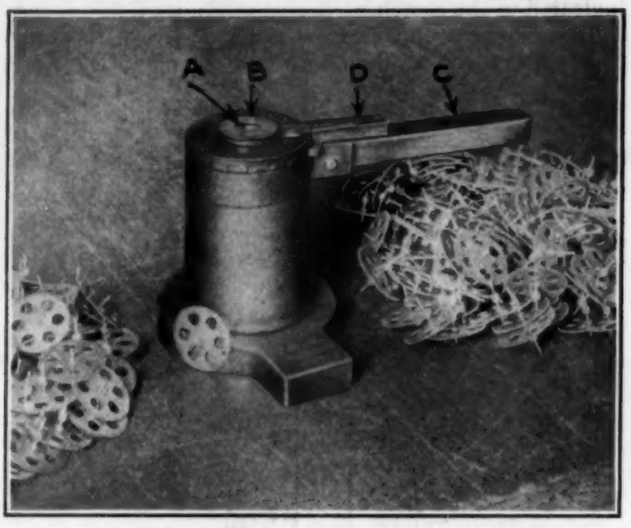


FIG. 2—ANOTHER METHOD OF TESTING HOLDING POWER OF FIT

the pinion shaft. The pinion drops into a toothed hole at *A* while one of the holes between the spokes in the wheel fits over the pin *B*. By moving the handle *C* the tension is shown by the pointer *D*. Both of these methods practically weigh the twisting load which the fit of the two pieces will stand, and prove that they will not loosen under the load exerted in service. These tests have practically eliminated the difficulties from this source.

Utilizing Fixtures on Different Machines —Discussion

By C. L. Henry

Beeston, Notts, England

The writer has read with interest the article under the above title on page 27, Vol. 57, of the *American Machinist* by Frank C. Hudson. It is true that the lack of uniform dimensions in the T-slots of machine tool tables has increased the cost of toolmaking considerably and decreased the number of production hours. It is, therefore, pleasing to know the American Society of Mechanical Engineers is considering their standardization.

The novel way of using interchangeable tongues for fixtures, as illustrated and used by the Lucas Machine Tool Company, Cleveland, Ohio, to get over the different widths of T-slots is of interest. As is customary in our plant, week by week, the contents of the *American Machinist* is read with eagerness, and the various articles discussed by the boys. After discussing this article we wondered if the cost of equipping fixtures with interchangeable tongues was worth while and we wish to explain our own method to get over the difficulty.

It was our practice to make interchangeable tongues of the plain pattern for our fixtures until about 3 years ago. Then we discovered that fixtures with narrow tongues were being used on machines with wide T-slots with satisfactory results. Since that time all our fixtures have been made with tongues to suit the narrowest T-slots and no difficulty has been experienced, while much time and material have been saved. When setting a fixture on a machine in wide T-slots it is only necessary to hold the fixture against the front or back face of T-slot and clamp it in position.

This method is undoubtedly open to criticism and we naturally conclude that, owing to the narrow tongues not being a good fit in the slots, the fixture is liable to move out of position while in use. But as tongues on fixtures are only put there to align or position them, the clamps and bolts should take all the strain and prevent them from moving.

To illustrate this, very heavy milling jobs are done in our plant using Brown & Sharpe No. 3 and No. 4 plain milling machine vices. They are not equipped with tongues to align them as the clamps and bolts hold them in position so firmly that they do not move out of alignment even under severe cutting strains.

Gage for Locating Holes from a Periphery

BY C. J. DORER

Very often after several holes have been drilled and reamed in a part, it is desirable to know the relationship between these holes and the outside edge of the part. The gage shown in the accompanying illustration was designed for the purpose of checking the relations of two holes with the outside of the disk in which they were drilled.

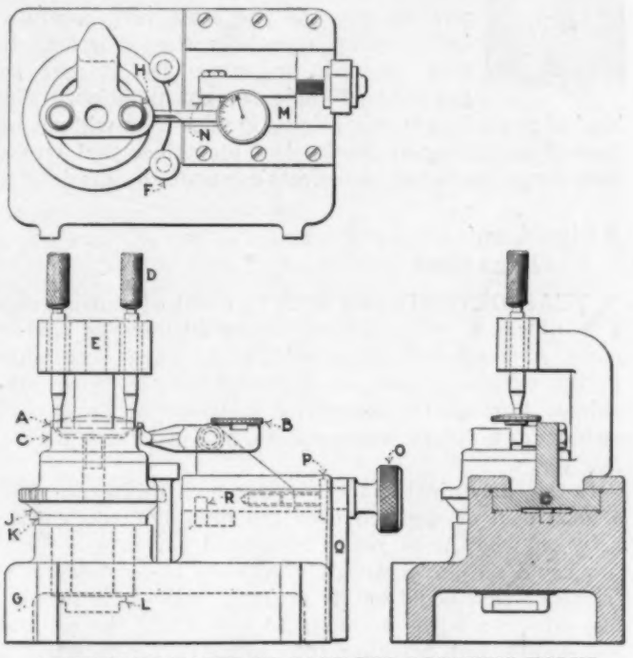
The holes in this case were drilled and reamed to a limit of plus or minus 0.00025 in. The center distance between the holes was held to a limit of plus or minus 0.0000 in. and the relation of the holes to the outside diameter was limited to a limit of plus or minus 0.0015 inch.

In checking the piece of work *A* is laid on the locating block *C*. The two plungers *D* are then pushed downward through the holes in part *A*, in which they are a close fit, and thus the piece is held tight in relation to the holes. The "Last Word" indicator *B* is moved into position, until the pointer registers on some convenient figure.

The piece *A* is now ready to be checked. This checking is accomplished by revolving the bracket *E*, which causes the periphery of the piece *A* to pass the indicator ball. The indicator pointer will register the amount of the variation in the distance from the holes to the periphery of the piece. It is not necessary to revolve the piece much over half the way around, as the opposite side of the disk will register the same amount of variation in the opposite direction; that is, minus instead of plus, or vice versa, as the case may be. The two stop pins *F* limit the motion of bracket *E* and protect the indicator against a blow from the arm of the bracket. It can be readily seen that the direction and amount of variation can be quickly determined, and, if necessary, the jig which drills the holes may be corrected.

The gage is built on a cast iron base *G*. The locating block *C* is a hardened tool steel block mounted on a bracket *E*. The plungers *D* slide freely up and down in the hardened bushings *H* which are pressed in the bracket E. The bracket E has a bearing plug J of as large a diameter as convenient, and revolves in and rests on hardened bushing *K*. The larger the bearing, the greater the degree of accuracy that can be maintained, and the more firm the bracket *E* will be. Lock nut *L* serves to keep bearing plug *J* from rising up out of place.

The indicator *B* is mounted on bracket *M* by means of stud *N*. Bracket *M* slides back and forth in ways



ASSEMBLED PARTS OF GAGE FOR LOCATING HOLES FROM A CIRCUMFERENCE

in base *G*. This bracket is moved forward and backward by revolving knob *O* which is securely fastened to screw *P*. Screw *P* has a collar which engages plate *Q* on one side and knob *O* serves as the collar on the other side, thus holding the screw in place as it revolves, and causing the bracket *M* to move.

Pin *R* is a stop pin which prevents the indicator from being jammed against locating block *C* in case bracket *M* is moved forward too far.

In order to get as accurate a reading as possible the ball of indicator *B* should move against the part *A* along a line coincident with the diameter of the part.

Soliloquies of Old Mac

When turning shouldered work in the lathe, upon which the shoulders must be accurately located with respect to each other, a scale is a very unsatisfactory tool to use for measuring the length, for the reason that it is always too short or too long, and in any event the hot chips from the tool have a tendency to curl around the operator's fingers in a way that is anything but comfortable.

To eliminate the discomfort and uncertainty, set an hermaphrodite caliper to the required dimension and then, with the caliper leg against the shoulder from which the measurement is to be taken and the hand away from possible contact with hot chips, the divider point will indicate the exact place at which to stop the tool from further cutting. More accurate work with less trouble and discomfort will be the result of using the caliper.

Editorial

A MACHINE is merely canned human intelligence. Like other canned goods it is well to examine the stuff very carefully before using, especially when it is old. It may be stale, or, worse yet, it may be spoiled and unfit for consumption. The kind of ptomaines it may stir up in your shop will not be noticed as quickly as the kind of ptomaines that wreck your inner works but the effects are none the less deadly.

A Significant Race Meet

NEAR DETROIT this week an event of unusual significance to machinery manufacturers is taking place. A race meet is being held in which the contestants in the various classes are heavier-than-air flying machines. Perhaps the connection betweeen airplanes and machinery builders seems remote, but just think back a few years.

In the early nineties there was some little interest and a good deal of derision over the first automobile race between what were really motorized carriages. Very few could see any connection between those noisy contrivances that could barely struggle through a twenty-five mile run without falling to pieces and the old and well-established machine tool industry. But what a difference a few years made! Within ten years speeds of a mile a minute were no longer unusual and then began the commercial development which revolutionized not only our methods of transportation but our methods of manufacture and our machine design as well. And what a machinery market was opened up!

Some people make the mistake of considering the airplane a competitor of the automobile. It is not and probably never can be. As a means of transportation it begins where the automobile leaves off. Its speed in a generation of men which places so much emphasis on time, counterbalances its greater cost of operation. Its size precludes its widespread use in congested districts. But who can foretell the direction or extent of its development? What prophet, twenty years ago, would have been rash enough to predict that two decades later the factories of the United States would be turning out more than two million motor cars in a single year?

The aëronautical pioneers have a harder job before them in their endeavor to educate the people to a comprehension of the possibilities of their product than the automobile men had, but they are turning to account the greater knowledge of transportation problems that twenty years of experience have given us. Where automobile races have always been speed, endurance or climbing contests for passenger carrying cars, this year's airplane meet includes events for light and heavy freight carrying machines as well as pure speed races like that for the Pulitzer Trophy. There is also an event for seaplanes.

The Detroit meet is only an incident in the development of aërial transportation but it is significant as an indication of how far and with what speed the art of flying has progressed.

Might and Right in Industrial Relations

PROGRESS OF civilization has been in a large measure a struggle between might and right. When might and right were combined in one man and one nation progress was rapid, but as a rule they were opposed to each other and progress was slow and halting, or negative. The fact that civilization has progressed is proof that right wins in the long run. Nor is this surprising, for we call that right or moral which is best for society, or at least for many, as against the desires of the few. This struggle takes place in many localities, under many different circumstances and between many different parties. Often he who is on the side of right in one issue is on the side of might in another.

There was a time when the struggle between employer and employee impressed us as if it were between might and right because the employer was only one and his employees many, and so we were instinctively inclined to take sides with the many. As the unions fought this fight we were inclined to be with them because their victory meant the greatest good to the greatest number. If the public suffered occasionally, it was willing to take its discomfort good naturedly. Where wood is hewn, chips must fly and neither one of the warring parties tried deliberately to hurt the public.

Things have changed. The coal strike was not an attempt to obtain the greatest good for the greatest number but was a display of might. The head of the miners' union did not claim that the miners were right, but that they had the power to enforce their demands. Whether the miners were right or not did not seem to interest him and was not mentioned, at least not in his public utterances.

That might has won for the present is neither surprising nor discouraging. An organized minority can always beat an unorganized majority. But such victories do not last. When the masses begin to feel the hurt and the injustice of it, they too organize and gather unto themselves the weapon of their oppressors, —Might. When might and right together combat might alone, right wins.

Progress of Uniform Cost Accounting

A CHART WORTH studying has been prepared by the Fabricated Production Department of the United States Chamber of Commerce. It shows the progress made in various commodity lines where uniform cost accounting has been achieved or attempted. The encouraging feature of the chart is the number of industries marked as being aroused to the importance of uniform cost accounting and actively engaged in pushing it. Only a few, however, have actually reached the point where a satisfactory system has been installed, although there are many more that have completed systems adapted to their respective needs.

In the statement accompanying the chart are some general truths, so-called, which may be worth emphasiz-

ing. One of them is that cost accounting uniformity is a plant of slow growth and one that requires constant encouragement. Another is that a cost system may be devised by an outside expert but that its adoption, modification to meet individual needs, and improvement must be accomplished by men of the different plants.

The Fabricated Production Department is to be congratulated for the success that has attended its efforts to stimulate interest in so vital a subject as uniform cost methods. It has a big job on its hands and needs all the support the Chamber can give it. Uniform cost accounting is a form of standardization that can be secured without great sacrifice on the part of the average manufacturer and one that will repay him and his industry many times for the effort expended.

Something About General Rules

NO GENERAL RULE should be applied with the eyes closed, not even this one. This warning is not new but it bears repeating, for there is nothing the average human being takes so gladly to his heart as a general rule. It relieves him of all responsibility in the matter at hand, gives him a weapon with which to put all critics to shame and makes unnecessary that most onerous task of all: individual thinking.

When a general rule is old enough it becomes venerable, something which cannot be said of all humans. To doubt its accuracy or investigate its merits is considered disrespectful. When still older, a general rule changes into a fetish. It then becomes sacrilege to so much as think about it in any other terms than those of submission and adoration.

In industry we find quite a number of these sainted general rules. So long as they are standing on their pedestals like idols, and are worshipped as such, they do no harm. But when they are consulted, they, like the oracle of Delphi are liable to start a lot of trouble. The courageous man asks them for advice which he follows only when his own mind tells him that it is proper.

Take, for instance, the general rule that the product should move through the shop in a straight (meaning continuous) line. Any other system is inefficient. We wonder how many millions of dollars have been sacrificed on the altar of this idol.

This rule looks good, in fact, is good if—. And this is exactly what we should say whenever we quote a general rule: If all other conditions are the same, and, if it does not cost more to apply the rule than to leave it alone, this rule, like all others, has its merits.

Some time ago we were in a very well conducted shop. The buildings, however, were old. The place had just grown and all departments were not exactly where they might have been. The general manager apologized for the lack of continuity in the line of movement of his product. He pointed out that a trucker had to move his stuff 300 ft. and back again, just because the buildings were as they were, and not as they should be.

A few questions brought out the fact that this happened five times a day, that the amount of unnecessary travel was 3,000 ft. per day for one man with a truck. We asked the G. M. how much money, he thought, could properly be spent to correct this evil and he smiled and grew more satisfied with himself and his shop. There are many cases where thousands of dollars have been spent for less cause than we saw in that shop. But then, there was a general rule which had to be obeyed.

The Increasing Use of Aerial Transport

OCCASIONALLY we run across a man who doesn't think that aviation will ever amount to much because he can't see that it has developed much since the early days. The facts are that flying has become so common that we read of very little in the daily papers except an occasional accident.

We are apt to forget that it was only twelve years ago that Hamilton flew from New York to Philadelphia and it was hailed as a remarkable feat. Yet when Lieut. Doolittle flew from Jacksonville, Fla., to San Diego, Cal., the other day in about 19 hours and with only one stop, in Texas, the papers hardly put it on the front page. Then too, we have had a twice-a-day service from Detroit to Cleveland, on schedule time, during the past summer, making the trip in 90 minutes as against 5½ hours by rail.

Perhaps the most striking instance of airplane utilization is that of Gen. Wm. Mitchell, assistant chief of air service, who has only used the railroad twice since he came back from France after the war. But this doesn't mean that he hasn't traveled, for he has flown approximately 200,000 miles during that time, visiting the various aviation centers. Railroad strikes mean nothing to him.

Aircraft development is going on in a fairly healthy fashion, and with the trend toward metal construction in place of wood, there is more and more likelihood of its being a factor in the machine building field. It is an industry to be encouraged in every legitimate manner, and machine builders should be among its boosters. Every aviation landing field is a potential market for more or less machinery, small tools and other equipment.

Just Suppose

JUST SUPPOSE all of the union railroad employees had been paying their dues regularly for the last ten years, and suppose this money had been honestly and intelligently administered, with as small an expenditure as possible for maintaining the union organization and other legitimate work. And suppose every time a union thought fit to strike it had refrained from doing so, but had made the would-be strikers contribute the amount they would have lost if they had struck a reasonable length of time.

Suppose further that all this money had been spent for railroad bonds and stocks, how many roads would now be under complete control of the railroad workers? Think of it. All the net income going to the men either as wages or as dividends. The Labor Board might reduce wages to the vanishing point and it would make no difference. And think of the beautiful chance of a union leader becoming a railroad president and riding around in his private car. Wages, working conditions, everything as the worker wants and dividends at the end of the year; a yearly vacation of not less than one month—with pay—instead of the annual strike of six weeks without pay and . . .

Of course, this is only a dream, it is not practical. There might be no dividends; the men might not be willing to pay their imaginary strike losses and besides why should a union want to do a thing like this when it would be almost certain to reduce the number of men required to run it. You cannot expect a man to kill his own job. No, it could not be done, but—

Just suppose.

Shop Equipment News

Holmes Tilted Threading Machine No. 3

A threading machine in which the spindles are tilted and which can be adapted to both internal and external threading has recently been placed on the market by the Holmes Engineering Co., Oshkosh, Wis. The machine, which is designated as the No. 3, has a capacity when cutting internal threads for taps up to ¾ in. in diameter on U. S. S. threads and 1 in. in diameter on S. A. E. threads. In Fig. 1 it is illustrated as equipped for tapping, with both forward and reverse movements for the spindles. Its particular adaptability is for work such as yokes, turnbuckles and other parts used in the manufacture of automobiles and farm machinery.

The six spindles are placed at an angle of 30 deg. from the vertical to permit of the proper lubrication of the cut when tapping, and also to allow the use of self-clamping jigs. The taps are chucked in spring collets. Four changes of speed are provided by means of change pinions and either right- or left-hand threads may be cut. Reversal of the taps at twice the cutting speed is performed automatically when the desired depth of thread is reached.

The arrangement of the work-holding jigs is such as to aid continuous tapping. Twelve jigs are employed, six of which are brought simultaneously up to the taps while the six idle jigs are being loaded. A treadle is used to move the jigs to the cutting tools, so that the operator can use both hands while unloading

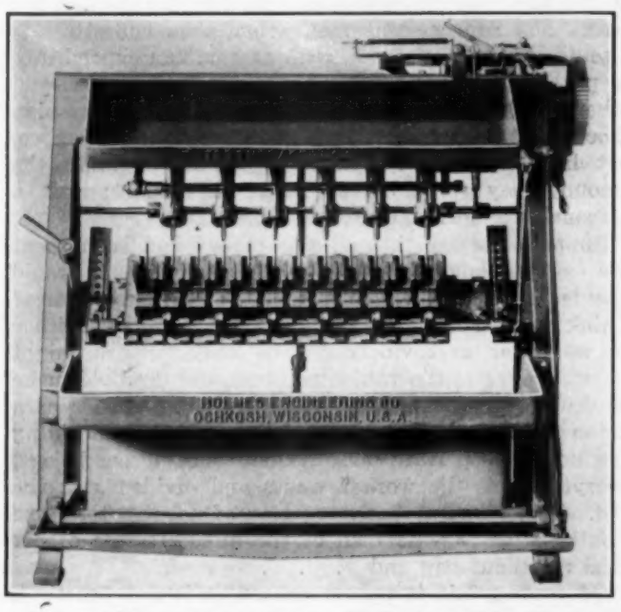


FIG. 1—HOLMES TILTED THREADED MACHINE NO. 3 EQUIPPED FOR TAPPING

and loading the idle jigs. The bedplate on which the jigs are mounted can be moved laterally on its supporting member so as to bring the proper jigs under the spindles. Feed is provided by pressure on the pedal.

The tilted arrangement of the jigs and spindles can be seen in the end view in Fig. 2. This view shows

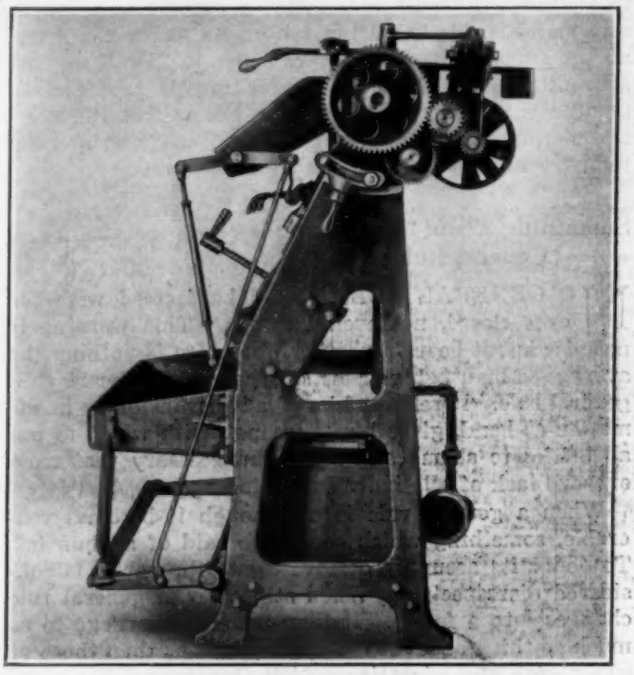


FIG. 2—END VIEW OF HOLMES THREADING MACHINE

also the arrangement of the pipes for bringing lubricant to the taps. The rotary pump forces oil to each individual spindle. A work shelf large enough to accommodate two tote boxes full of parts is located just above the spindles. It is inclined downward so that the parts are within easy reach of the operator. A trough below the jig is arranged to drain the lubricant into the tank at the rear. The arrangement of both the shelf and the trough is shown in the end view.

The machine is driven from a countershaft. Large bronze bearings are employed throughout and all thrust

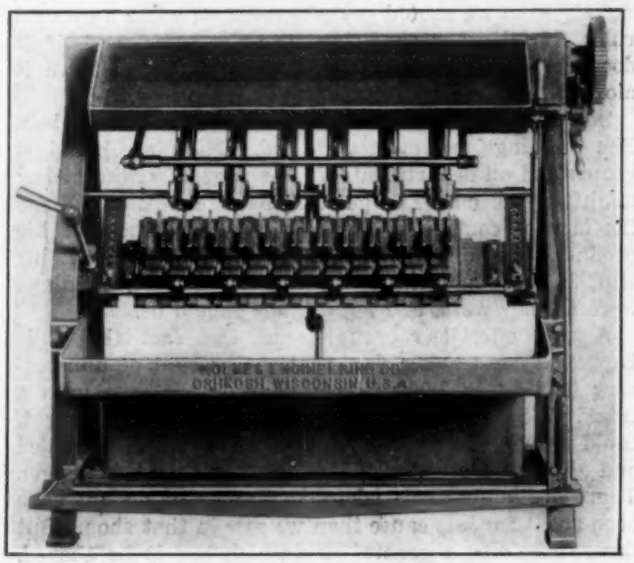


FIG. 3—HOLMES MACHINE FOR EXTERNAL THREADING

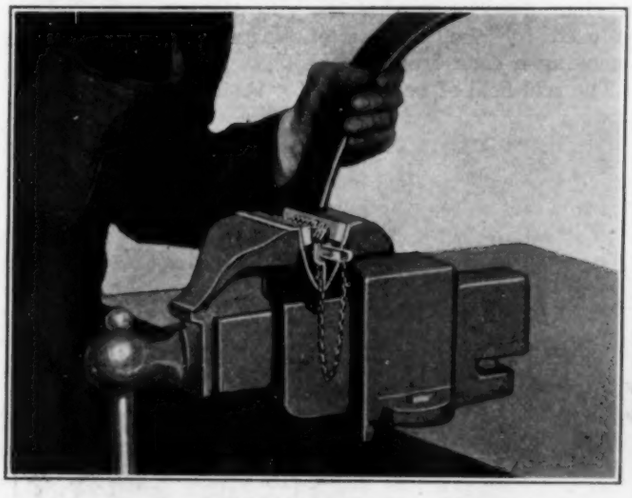
points are fitted with ball thrust bearings. It is stated that the machine is capable of production of 1,000 to 1,500 pieces per hour on average work.

When employed for external threading, the machine has a capacity up to 1 in. U. S. S. or 1¼ in. S. A. E. threads, and can be employed when threading such pieces as cap screws, king bolts, spring clips and similar parts where large production is required. It is stated that a production of 1,000 to 2,000 pieces per hour can be maintained.

In Fig. 3 is shown the non-reversing threading machine, equipped with self-opening dies. As in the previous case, four changes in speed are obtained and either right- or left-hand threads may be cut. The inclined position of the spindles prevents the lodging of chips in the dieheads, which might occur if the spindles were horizontal. The arrangement of the work-holding jigs, the shelves and the lubricating system is the same as when the machine is equipped for internal threading. The machine requires a floor space of 66 x 41 in., and the height over the gear cover is 65 in.

Detroit Belt-Lace Closing Tool for Use in a Vise

A device has recently been placed on the market by the Detroit Belt Lacer Co., Detroit, Mich., by which its wire belt lacing can be applied to belting without the use of the regular bench-type closing machine made by the concern. To operate this small closing machine, a vise is necessary, as shown in the accompanying illustration. The device is normally held open by means of a spring so that it retains its position on the vise jaws. When the vise is closed, the jaws always come to the proper position to shape the lacing. The device is made of steel, while the magazine is bronze, the same as in the large standard machine. The outfit should be of



DETROIT SMALL BELT-LACE CLOSING TOOL

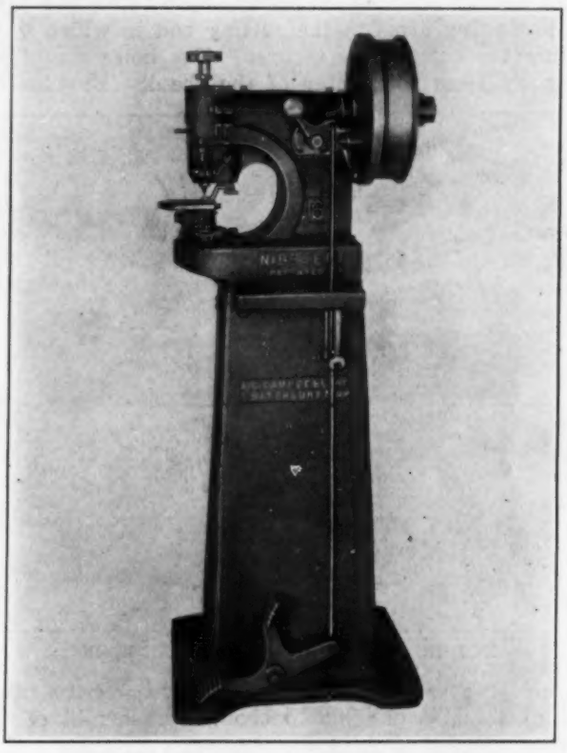
use particularly in the small shop, garage or mill where belting is employed.

The standard staggered type of Detroit wire belt lacing is employed. The hooks mounted on cards can be placed in the closing device, the belt held in position by the operator with one hand and the vise handle operated with the other. Pressure is used to sink the hooks into the belt and flatten the lacing. Rawhide pins are employed to connect the lacing on the two ends of the belt.

Campbell Nibbling Machine

A machine known as a "nibbling machine," for cutting irregular forms from sheet metal, celluloid, fiber or other material that can be worked with punch and die, has recently been placed on the market by A. C. Campbell, Inc., Waterbury, Conn. It will handle sheets of any thickness up to ⅛ inch.

The machine, which is herewith illustrated, is in effect a small punch press and does its cutting by



CAMPBELL NIBBLING MACHINE

means of a small cylindrical punch and die. It runs very rapidly, and the work may be pushed or pulled in any direction by hand, following an outline marked upon the surface much as one would cut out a wooden pattern upon a jig saw, and at about the same speed. An average speed of 18 in. per minute is claimed.

The punch has a central pilot and the ram is so set that this pilot does not at any time come above the surface of the work. Thus the amount of stock that is cut out at each stroke, or the rate of feed, is governed by the difference in diameter between the punch and the pilot.

Closed outlines, as strippers for blanking dies, may be cut as readily as open ones by first drilling a small hole anywhere within the contour to be cut out. The movement of a small lever in the ram withdraws the pilot and allows the sheet to be entered under the punch without disturbing the adjustment of the ram. To start the work this lever is thrown down, entering the pilot in the drilled hole.

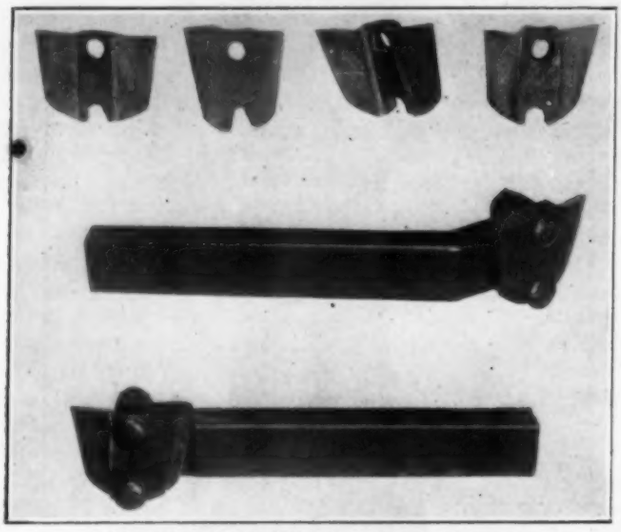
When used for repetition work a templet is first made to the desired contour, and with this attached to the sheet the machine will reproduce it without the necessity for the operator to watch a line. An attachment enables the machine to cut circles of any size up to 28 in. in diameter.

The punches are about ⅛ in. in diameter and are made from a special alloy steel. They are double ended and may be reversed and replaced in a minute's time.

Morris Toolholder and Interchangeable Cutters

A toolholder and interchangeable cutters of different styles that adapt the device to practically all types of work for which a toolholder can be used is a recent product of the Morris Tool Co., Inc., 30 Church St., New York, N. Y. The illustration shows both the straight and the offset holders, as well as a number of the blades or cutters that can be fastened to these holders.

The holders are made of chrome-nickel steel and have two projecting arms at the cutting end in which bolts holding the cutters are secured. The holes are offset unequally from the center of the shank. By turning



MORRIS TOOLHOLDERS AND CUTTERS

the holder over and fastening the blade on the other side of it, it is possible to change the height of the cutting edge.

The construction of the high-speed steel blades is probably the most interesting feature of the equipment. Each blade has two cutting edges, and can be turned so as to employ either one of them. It should be noted that the cutting edge is very well supported, so that there is less danger of breaking the cutter than when tool bits of small section are placed in standard toolholders. The tools are made for turning, cutting-off, threading and facing, the method of fastening to the holder being the same in each case so that the blades are interchangeable.

The side and front angles of the cutters are always kept correct, because they are formed in the manufacture of the cutter. When sharpening, it is necessary merely to grind the top slope. Regrinding may be carried to such an extent that only a small lip remains at the bottom. Thus only a very small piece of tool steel need be discarded when the blade is worn out.

Two chrome-nickel steel bolts fasten the cutter to the holder. A bifurcated hole in the blade rests on the bottom bolt, but the top bolt passes through a hole in the upper part of the cutter. The blade is thus both supported and suspended. The construction is stated to be so firm that very heavy cuts can be taken with practically the same rigidity that results when using a solid forged tool. Because of the intimate connection of the two members and the large cross-sectional area of them, the heat of the cut is conducted from the cutting edge so that there is little liability of overheating the blade.

The tool can be applied to lathes, planers, shapers, boring mills and slotters, and is adaptable to practically any operation of cutting on these machines. A set of tools will be readily interchangeable as regards both the cutters themselves and other machines. A complete set of the tools consists of one straight, one right off-set and one left off-set toolholder, three left-hand roughing tools, three right-hand roughing tools, two 60-deg. U. S. F. or V thread tools, two cut-off tools, one right-hand and one left-hand side tool. The use of this equipment is stated to enable a large saving in weight and number of tools as compared with the forged tools and special tools required for the same work. The tools are adapted particularly to the heavy-duty work such as axle and wheel turning that is encountered in railroad shops.

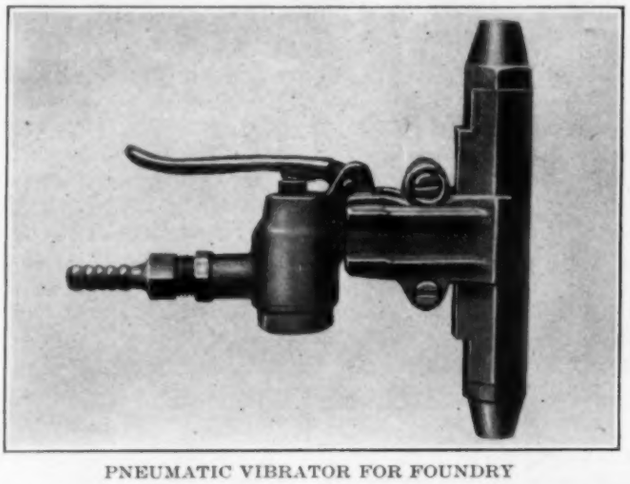
At the top of the accompanying illustration, reading from left to right, are shown a double cutting-off tool, a double threading tool, a right and left side tool, and a right and left roughing tool. The great depth of the cutting-off tool gives it rigidity. With the double threading tool, one side can be used for roughing and the other side for finishing, without moving the holder. The tool is merely turned around, and the proper angle thus maintained throughout the whole operation.

Twelve sizes numbered from 2 to 18-B are made. The holders vary from $\frac{1}{4}$ x $\frac{5}{8}$ x 4 in. in the smallest size to $2\frac{1}{2}$ x 3 x 24 in. in the largest size, and the blade thicknesses vary from $\frac{1}{8}$ to $1\frac{1}{8}$ in. The tools are normally kept in stock up to the No. 12 size, which carries a blade $\frac{3}{4}$ in. thick and has a holder $1\frac{1}{4}$ x 2 x 13 in. in size.

Pneumatic Vibrator for Foundry Use

On page 121 of *American Machinist* there was described a pneumatic vibrator for foundry use, made by the Malleable Iron Fittings Co., Branford, Conn. The clamping arrangement of the device has been changed somewhat, so that it appears as in the accompanying illustration. It was erroneously stated in the previous description that the vibrator was intended to be used for the purpose of jarring the flask when removing a cope from the pattern.

The real field of usefulness for the device is, however,

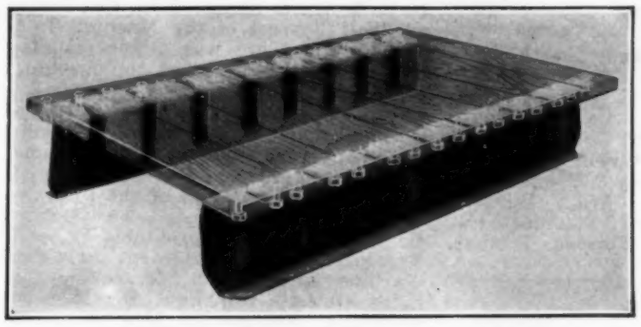


PNEUMATIC VIBRATOR FOR FOUNDRY

in the core-room, where it is used for rapping core driers or core boxes when removing the cores, to avoid danger of breakage of them. The vibrator should be attached to the air line by a sufficient length of flexible tube to enable the operator to reach any position desired. Air pressure of 20 lb. per square inch or upward is required.

Barrett "Steeleg" Truck Platform

A lift-truck platform that combines both wood and steel in its construction has recently been placed on the market by the Barrett-Cravens Co., 1328 W. Monroe St., Chicago, Ill. The construction of this "steeleg" platform, as it is called, is well shown by the phantom view in the accompanying illustration. The top of the platform is made of wood and can be from 1¼ to 2 in.



BARRETT "STEELEG" TRUCK PLATFORM

in thickness, depending upon the class of work for which it is intended. Flat-head bolts fasten the boards to the steel legs or skids; they are countersunk so that they do not project above the wood.

The legs are made of heavy-gage flanged steel plate and have vertical ribs to prevent buckling. The lower flange rests on the floor and is wide enough so as not to injure or cut the floor. The upper flange has a wide bearing for the top, and its turned-up edge protects the ends of the boards. The construction is such as to make a very rigid and durable platform that is capable of continuous service under heavy loads.

The legs do not wear or shrink as wooden skids do, so that the truck can always be run under the platform, even after long use. The fact that the top of the platform overhangs the skids at the sides gives greater load-carrying capacity for the same thickness of the top boards.

"Nitrol" Casehardening Compound

The American Kreuger & Toll Corporation, 522 Fifth Ave., New York, N. Y., has just placed on the market a casehardening compound designated as "Nitrol." The compound is a nitrogenous powder that can be employed for surface-hardening iron and steel under practically any conditions. Rusty objects can be hardened as well as polished ones. A surface hardened with Nitrol is stated to be practically rustproof.

The compound is furnished in two grades, Grade A being used for surface hardening and Grade E for pack hardening to depths up to ⅛ in. The Grade A or sprinkling powder melts at 1,200 deg. F., and does not give off poisonous or obnoxious fumes. Cast steel or alloy pots similar to those employed for cyanide may be used, but the life of the pot is much longer than when cyanide is employed. Ordinarily, the articles to be hardened are immersed in a molten bath of the cyanide at a temperature from 1,375 to 1,400 deg. F. After being in the bath for from 5 to 20 min., the pieces are quenched in brine. The surface obtained is stated to be bright and free from scale.

When carburizing in pots, the parts are packed with the Grade E Nitrol and then heated in the usual manner up to 1,475 to 1,550 deg. F. for from three to eight hours. The parts are removed and quenched in the usual manner, either directly from the box or reheated to 1,425 deg. F. and quenched. The depth of the case is stated to vary from ⅛ in. for a two or three hour treatment, to ⅛ in. for from seven to eight hours. The surface obtained is smooth and free from deposit or marking. The moderate temperature required does not seriously injure the grain size of the core and thus weaken the work. Economy in the use of fuel and the longer life of the furnace resulting from the moderate temperature are also advantages of the compound. The material can be re-used repeatedly.

Whitney Roller Bearing

A roller bearing in which the rolling action is obtained by means of cylindrical disks, as shown in Fig. 1, has been developed by the Whitney Bearing Corporation, 467 East Ontario St., Chicago, Ill. The periphery of each disk is parallel with the axis, and the diameter is twice the thickness, regardless of size. Both conical surfaces of the bearing have the same angle.

The rollers operate between parallel surfaces, as

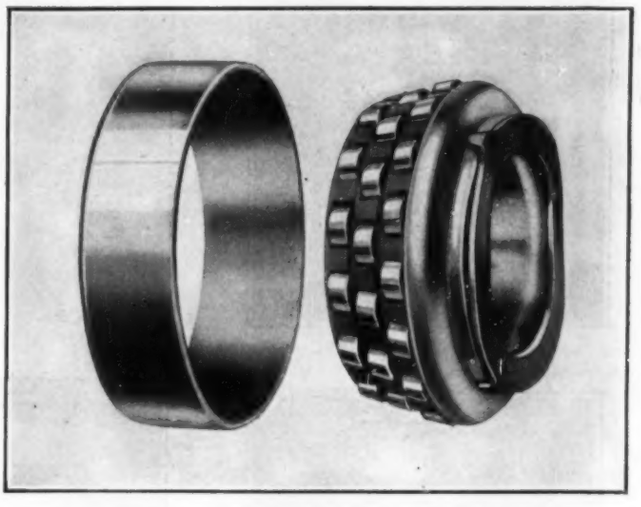


FIG. 1—WHITNEY ROLLER BEARING

shown in Fig. 2, which construction is intended to eliminate end thrust and the accompanying friction, which occur when tapered rollers are used, and to transmit the load to the face of the roller only in a direction perpendicular to the axis of the roller. The several series or rollers are carried in separate ring cages, as the rollers nearer the apex of the cone travel faster than those nearer the base.

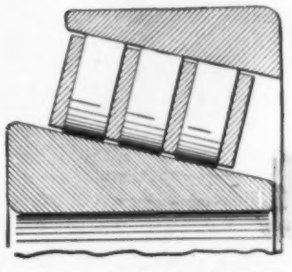


FIG. 2—CROSS-SECTION OF ROLLERS

Another feature of the bearing is the adjusting spring, which, it is said, exerts just the right pressure to keep the bearings in complete contact. The adjustment is automatic and the pressure on the bearing is uniform, assuring that all the rollers are in contact with the cone surfaces at all times. The bearings are made in all sizes, so as to fit them for a wide range of work where both radial and thrust loads must be carried.

News Section

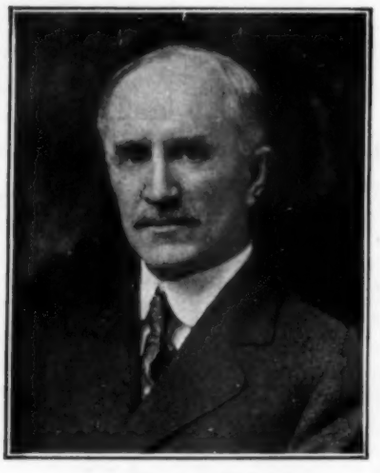
Important Discussion Features Convention of Machine Tool Builders

An innovation in connection with the 21st annual convention of the National Machine Tool Builders' Association was its being held in an out-of-the-way place, Lenox, Mass. The topics to be discussed were of so much importance that the members felt justified in getting off to themselves where they would not risk interruption, and the comments of the large number present indicated that such procedure was entirely satisfactory and the meeting a success in every respect.

E. J. KEARNEY

WINSLOW BLANCHARD

O. B. ILES



JAMES N. HEALD

The new officers elected are: E. J. Kearney, Kearney & Trecker Corporation, Milwaukee, Wis., president; Winslow Blanchard, Blanchard Machine Company, Cambridge, Mass., first vice president; O. B. Iles, International Machine Tool Company, Indianapolis, Ind., second vice president; James N. Heald, Heald Machine Company, Worcester, Mass., treasurer; Ernest F. DuBrul continues as secretary and general manager with offices in Cincinnati, Ohio.

Directors are: A. H. Tuechter, Cincinnati Bickford Tool Co., Cincinnati, Ohio; C. Wood Walter, Cincinnati Milling Machine Co., Cincinnati, Ohio; E. J. Kearney, Kearney & Trecker Corporation, Milwaukee, Wis.; Winslow Blanchard, Blanchard Machine Co., Cambridge, Mass.; Howard Dunbar, Norton Company, Worcester, Mass.; Frank N. MacLeod, Abrasive Machine Tool Co., East Providence, R. I.; Edward P. Welles, Charles H. Besly & Co., Chicago, Ill.; O. B. Iles, International Machine Tool Co., Indianapolis, Ind.; James N. Heald, Heald Machine Co., Worcester, Mass.

Three days, Tuesday, Oct. 3 to and including Thursday, Oct. 5, were given over to the meeting beginning with the usual registration and business session during which the address of President Tuechter, printed in another section of this issue, was delivered. During the same session William A. Viall, secretary, Brown & Sharpe Mfg. Co., spoke on "Self Respect of the Machine Tool Trade" and there was a general discussion on the ethics of the machine tool industry.

The second session was devoted to a consideration of administrative subjects, being closed with a round table discussion. Addresses were delivered by O. B. Iles, president of the International Machine Tool Co., on "Conditions that Create Unprofitable Prices," Frank N. MacLeod, president, Abrasive Machine Tool Co., on "Improving the Sales Outlet" and Paul E. Thomas, president, Kempsmith Mfg. Co., on "Dealers' Problems."

Committee meetings were held on the second day, both morning and afternoon. In the evening Joseph K. Schofield, Chief of Patent Department, Niles-Bement-Pond Company, spoke on "What Patents Are Worth to the Machine Tool Industry." The session ended with a round table discussion on technical topics.

All of Thursday, the third day, was devoted to association affairs, including the receiving of reports and the election of officers.

Discussion throughout the convention was earnest and thorough. How much ground was covered may be seen from the following list of topics:

Administrative Subjects

1. What is a fair return on capital invested in business?
2. Do machine tool investors get fair returns compared to other industries?
3. What rate of turnover of total capital must a machine tool business have to produce a fair return?
4. What ratio should plant investment bear to working capital in the machine tool business?
5. What rate of turnover of working assets must a machine tool business have?
6. What is a fair percentage of idleness to figure on in overhead costs due to depressions?
7. How shall we get cost accounting generally in line with Scovell Wellington report?
8. What are the prospective conditions of cost-labor-material-expense?
9. On what basis should the cost and selling price of repair parts be based?
10. Can a code of ethics be drawn to advantage?
11. Elimination of everything savoring of unfair competition.
12. Would it be well to exchange experience and information as to the men who are using unfair methods?
13. How can various statistics be used in guiding financial policies?

Technical Subjects

1. Are patents in the Machine Tool Industry not good?
2. How do you get sales departments to co-operate with the engineering departments on standardization?
3. What research work would it b

well for the association to undertake?

4. What standardization is common to various types of machines?

5. How far can we go in the elimination of unnecessary sizes?

SALES SUBJECTS

1. What are the best prospective foreign markets at this time?

2. How can we secure complete information covering new developments in the machine tool line as made by leading European machine tool builders, and the specifications and prices thereof?

3. Does it pay to furnish automobiles for salesmen? Under what conditions are these furnished and what is cost of upkeep?

4. How can we raise the standard of machine tool salesmanship?

5. What percentage of gross sales is best spent on free engineering service of various kinds?

6. How far should the machine tool builders be called on to send factory representatives to close sales for which the dealer agent draws a commission?

7. What percentage of gross sales is best spent on salesmen's expense?

8. How prevalent is the demand for long time credits, and how is it best met?

9. Can we establish a uniform basis of cash discounts and standard sales terms, i. e., time?

10. What would be considered fair credit and sales terms for special machinery sold direct to purchasers and machines sold through dealers?

11. What is the best method of handling matters of credit on extended terms?

12. What is a fair term of credit to be accorded to machine tool buyers?

13. Is there any abuse of standard 30-day terms by excessive credit extension?

14. How far is free engineering service abused? (Designs, time studies, data sheets, production studies, etc.)

15. How can the duplication of engineering work be avoided, that nowadays often involves more total expense than any possible profit to the one who gets the order?

16. How can the buyer be kept from unfairly working one competitor against the other?

17. Asking sales departments to create an unnatural demand for tools.

18. Has a liquidated damage clause stopped cancellations?

19. Attitude of some purchasers in attempting unwarranted pressure on machine tool builders.

20. Exchange the best arguments and develop methods of combating unfair practices of purchasers.

21. The buyer worries about the machine tool builder's cost of production, instead of figuring the utility of the machine to himself against the price asked.

22. How can we educate the buyer on value of machines, to buy production, not pounds?

23. How long should we furnish repairs for old types of machines?

24. Credit and sales information regarding dealers and agents.

25. How does present sales organization of the industry compare with prewar conditions and how can we improve it?

26. What is fair practice when changing agents, as to taking back stock that is considered necessary to carry if the line is to be properly represented?

27. What is an equitable arrangement for division of commission between selling agents where purchases are made in one territory for shipment to another?

28. What provisions ought to be put in agency contracts?

29. What is a proper commission for agents?

30. How to get dealers to notify manufacturers of all pending deals and report progress made on same from time to time?

DEALER PROBLEMS

1. Overstocking—especially on prices guaranteed against decline.

2. Pressure of dealers for cancellations.

3. Status of dealer contracts in view of recent court decisions.

4. What is a contract of agency and one of sale? Are exclusive sales contracts valid—or binding?

Ordnance Officers and Engineers Meet at Aberdeen

This year's meeting of the Army Ordnance Association, the fourth annual gathering, was held at the Aberdeen Proving Grounds on Oct. 6 in conjunction with the Society of Automotive Engineers and the American Society of Mechanical Engineers. Great credit is due those responsible for the smoothness with which everything ran. About 500 were present to witness demonstrations of the latest developments in guns, projectiles and automotive ground and aerial equipment.

Guns of all sizes were seen in action from sub-caliber machine guns to 16-inch railroad mounts. Tanks, tractors and trucks were maneuvered about the field, bombs were dropped from airplanes and plenty of time was allowed for inspection of every type of equipment from a non-rigid dirigible balloon to an automatic pistol.

Perhaps the most spectacular event was the controlling of a whippet tank by means of orders given over a radio sending set. It was almost uncanny to watch the little tank turn and twist at commands spoken in an ordinary tone by an officer half a mile away.

Almost equally spectacular was the tracer ammunition firing both by daylight and after dark and the firing of phosphorus rifle grenades, but the most impressive exhibition was that of smokeless, flashless powder in the 75 and 155 mm. guns. Rounds of two different kinds of flashless powder were mixed in between rounds of service powder and the contrast between the two on the dark "main front" drew forth applause from the visitors.

Large Mexican Machine Tool Order

The National Mexican Railways have placed an order for machine tools with Jos. T. Ryerson & Son, Chicago, Ill., amounting to $308,000.

Steel Treating Convention Draws Big Crowd

The convention of the American Society for Steel Treating held in conjunction with the annual meeting of the American Drop Forging Institute which was brought to a close last week in Detroit was regarded by all present to have been the most successful in the history of both bodies.

The total attendance upon the convention was estimated at between eighteen and twenty thousand persons. Of the membership in both bodies, there were thirteen hundred present or approximately 50 per cent of the total.

The chief feature of the convention was the number of executives present and interest was centered chiefly in the exhibit which was considered to be the most successful ever held, fully one hundred more companies displaying their products than in previous years. Nearly all the machinery displayed on the floor was sold during the convention.

Tuesday and Wednesday evenings, Oct. 3 and 4 were given up to smoker and carnival frolic. On Thursday, Oct. 5 the annual banquet was held at which the chief speakers were: President Burton, University of Michigan and Frank Hook Alfred, president of the Pere Marquette Railway. T. E. Barker and W. P. Woodside, both of whom have been instrumental in establishing and furthering the interests of the American Society for Steel Treating were the recipients of founder memberships in recognition of their work.

On Thursday afternoon a bronze tablet was unveiled at Wyandotte, Mich., to William Kelly who was the first to use the Bessemer process in America.

Among the papers read during the sessions of the convention were the following: Furnace Atmospheres and their Relation to the Formation of Scale by G. C. McCormick; The Effect of Structure upon the Machining of Tool Steel by J. V. Emmons; Case Hardening by A. H. d'Arcambal; Lathe Breakdown Tests of Some Modern High Speed Tool Steels by H. J. French and Jerome Strauss; Heat Treating in Lead by R. B. Schenck; Irregularities in Case Hardened Work caused by Improperly Made Steel by E. W. Ehn; Study of Some Failures in Aircraft and Engine Parts by J. B. Johnson and Samuel Daniels; and Carburizing and Decarburizing in Case Hardening by H. B. Knowlton.

Officers elected for the ensuing year were: T. B. Lynch, Westinghouse Electric and Manufacturing Co., president; W. S. Bidle, of the W. S. Bidle Co., Cleveland, second vice president and W. H. Eisman, secretary.

Iron and Steel Men Will Meet October 27

The twenty-second general meeting of the American Iron and Steel Institute will be held in this city at the Hotel Commodore on Friday, October 27. The opening address will be made by Judge Elbert H. Gary, chairman of the board of the United States Steel Corporation. Many papers covering the different phases of the iron and steel industries are to be presented.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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AT THE annual meeting of the American Bankers' Association held in New York last week some 7,500 bank officers from all over the country were present, and with every authority from Secretary Mellon down telling them that "good times have come again" a nationwide boom should commence as soon as they get home, provided they believe what they heard.

But while the bankers may, from force of habit, discount what they were told, it is true nevertheless that an expectation of active business and good trade is general all the way from the Atlantic to the Pacific. Sales and prices are commencing to reflect it.

In their circular of last week Marshall Field & Co. of Chicago is definitely optimistic, especially in regard to cotton goods, and "customers are advised to cover their requirements up to the end of next January." John V. Farwell & Co. write in the same strain and say that "there is no reason why retailers should not feel safe in purchasing merchandise according to their normal needs." These two pronouncements from practical and successful merchants find academic confirmation in an address before the National Association of Cotton Manufacturers, in which Professor Copeland of the Harvard Bureau of Business Research predicts an unexampled expansion in the cotton manufacturing industry in the near future.

With optimism so general it is not surprising that almost everything but coal is firm or higher, and the decline in coal is regarded as a blessing by everyone but the coal dealers for whom, rightly or wrongly, no sympathy is felt. Regarding the commodity markets it is hardly necessary to particularize. The advancing tendency noticeable in wheat is probably the most important item in the week's commercial news as it implies an increase in the purchasing power of the agricultural West. But the strength of cotton in the face of a ginning report that is somewhat inconsistent with extremely small crop estimates is another significant straw in the business current of the week.

The long excepted advance in rubber has also started. Woolen goods, silk, paper, hides, kerosene, metals and sugar are all likewise firmer or higher, and making allowance for technical influences in the case of each commodity it is reasonable to expect that higher wages and the tariff will gradually lift the level of commercial values until there is another buyers' strike, of which there is no indication at present.

The National Association of Credit Men is about the only important authority that is not optimistic. In convention at Atlantic City it passed a resolution declaring that "there is no ground for believing that a business boom is in sight," and cautioning merchants against overbuying.

Most merchants are, however, inclined to think that the Credit Men are premature in their warning, for there is a general belief that stocks are unusually low and that there is less commodity speculation than for years.

The principal if not the only bad spot in the domestic situation is the increasing railroad congestion. There is a serious shortage of cars. The traffic awaiting shipment and on the tracks is enormous. Many roads have declared embargoes and there is every probability that the money market will be tightened and distributive trade blocked by the delay in the delivery of goods. The railroad managers are, however, working hard to relieve the blockade and they promise better service if consignees will but co-operate in unloading cars promptly.

> From the Atlantic to the Pacific, sales and prices reflect an expectation of active business and good trade, making the domestic situation one of promise. The biggest obstacle to a return of general prosperity is unquestionably embraced in the economic unsettlement in Europe, demanding the formulation of some definite plan of action on the part of this country with respect to war debts and a European policy.

The big railroad earnings that are expected during the last months of the year are already reflected in a firmer market for railway shares on the Stock Exchange, but I see nothing to change my previously expressed opinion that bonds and industrial securities will fluctuate hereafter inversely in relation to the money market. If interest rates go up securities will go down and vice versa. But there is no present indication that rates will go lower and the Federal Reserve Bank of New York says that they "have grown firmer and have risen fractionally" because of the increased demand for commercial accommodation.

The weekly statement of the Federal Reserve System confirms this view, for it discloses a decline of 1 per cent in the reserve ratio, which now stands at 77.4 per cent despite an increase of over $12,000,000 in the gold held.

The political as well as the financial news from Europe is encouraging. Kemal Pasha has evinced a willingness to parley that is inconsistent with an eagerness for war. Some cynics suggest that "English Sovereigns" may have brought him to a recognition of English sovereignty in the Levant, but whatever the facts it is plain that the crisis has passed for the London markets are strong and sterling exchange is higher. Marks are, however, slipping out of sight. An additional 26 billion were issued during the week ending Oct. 5 and last Friday they sold at 4½ cents a hundred in New York. This is the lowest price yet touched. The New York World estimates that Americans have lost nearly a billion dollars in buying marks and German mark bonds.

There would seem to be but little chance of any advance in the value of the mark unless an Allied loan to Germany, in which the United States shall participate, can be arranged. Of this there is little hope, although Thomas W. Lamont of the Morgan firm and Reginald McKenna, now chairman of the biggest bank in England and formerly Chancellor of the British Exchequer, both made addresses before the American Bankers Association that might be construed as intended to pave the way for some such program.

Mr. Lamont suggested waiving our claim for that portion of the debt due us by the Allies that was incurred before we commenced sending men to Europe in 1918, and Mr. McKenna very tactfully intimated that it would be good business for us to write off the sums due us by those nations who were too impoverished to pay.

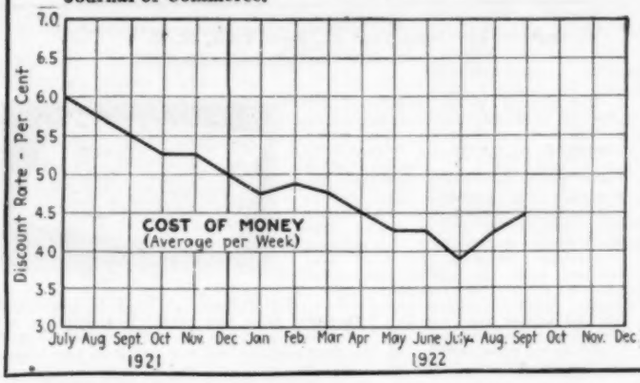
From this group he specifically excluded Great Britain, who could and would, he asserted, honor her obligations. It remains to be seen whether American public opinion will be much changed by these speeches.

The only other sensation at the Bankers' Conference was the vociferous adoption of a resolution opposing the establishment of branches by National Banks in those states in which branch banks were permitted by the state laws. The resolution was in fact a condemnation of branch banking in general upon the theory that it would ultimately bring the credit reservoirs of the people under the control of a few men. It is an old issue in a new form. Much may be said on both sides.

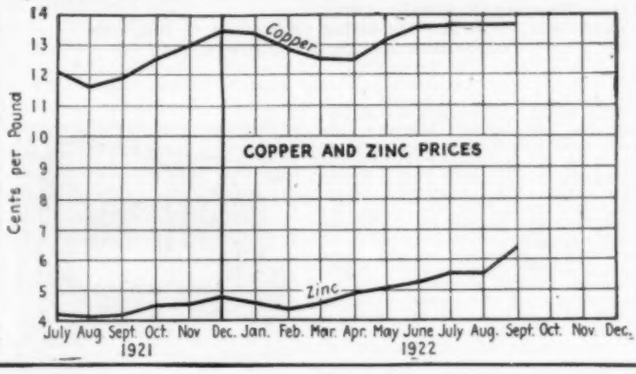
It is estimated that the expenses and expenditures of the 7,500 bankers and their wives who attended the New York meeting will exceed $2,500,000 and the fact that they were willing to leave home and spend this sum is in itself encouraging in the light it sheds on financial conditions throughout the country.

They are sound, and until credit becomes scarcer and restricted the optimism that now extends from ocean to ocean seems justified.

Average weekly rates for 60 and 90 day commercial paper based on daily New York quotations furnished by the Journal of Commerce.



Average of New York weekly quotations on electrolytic copper and zinc as reported by Engineering and Mining Journal-Press.



COST of money showed no marked change during the month of September as compared with August. Prime commercial paper ruled at 4 to 4¼ per cent with a slight upward tendency. Call money showed a higher tendency. Time money was in fairly active demand, 60 day maturities ruling around 4¼ per cent with longer maturities quoted at 4½ per cent. The tendency during the latter part of September has been for the rates to harden with the increased demand for funds resulting from the West for crop movement purposes.

Copper and zinc prices, on the average, show but fractional changes during September. The average price on the New York market for the former was 13.748 cents as against 13.723 cents in August. Zinc averaged 6.110, a decline from 6.212 cents. Surplus stocks of copper are reported as being practically exhausted with Germany a heavy buyer. With an increasing demand for domestic construction and a steady export demand, producers are now asking from 14 to 14⅛ cents. The price of zinc appears to have softened as a result of a decrease in demand caused by the effect of freight embargoes, fuel shortage and labor scarcity on consumers.

Equipment shares advanced during September, the average price for 10 representative issues being $110.40 as compared with $104.60 in August. The high point was reached about the middle of September. Since that time there has been but a slight recession, adverse foreign news having but little effect. The car and locomotive building firms all show healthy financial statements and reports indicate a considerable volume of business booked from the railroads during September. Locomotive builders have also booked a fair volume of foreign business with numerous inquiries reported pending.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

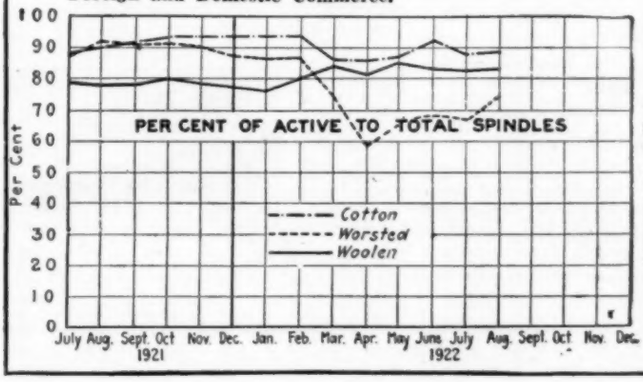
	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.....	$0.0292	$0.0285	$0.0273
Cold finished shafting.....	per lb.....	0.0378	0.0365	0.0384
Brass rods.....	per lb.....	0.165	0.1700	0.135
Solder (½ and ½)	per lb.....	0.22	0.225	0.20
Cotton waste..	per lb.....	0.11	0.11	0.122
Washers, cast iron (½ in.)...	per 100 lb.	3.83	4.00	5.00
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100.....	3.11	3.11	.....
Lard cutting oil	per gal.....	0.575	0.575	.....
Machine oil....	per gal.....	0.36	0.36	.....
Belting, leather, medium.....	off list.....	40–5% @50%	40–5% @50%	
Machine bolts up to 1 x 30 in.	off list.....	55% @60%	50%@ 65–10%	50%@ 60–10%

Textile industrial activity in the United States during the month of August compares favorably with the July period, September figures not yet being available. Cotton spindleage active amounted to 87.9 per cent of the total in place as compared with 86.5 per cent in July. In the woolen industry there was a fractional decline from 83.7 per cent to 82.9 per cent. Worsted conditions, on the other hand were better, active machinery amounting to 74.8 per cent of the total in place as compared with 68 per cent in July. Settlement of textile labor troubles, with a strong domestic and export demand has improved conditions.

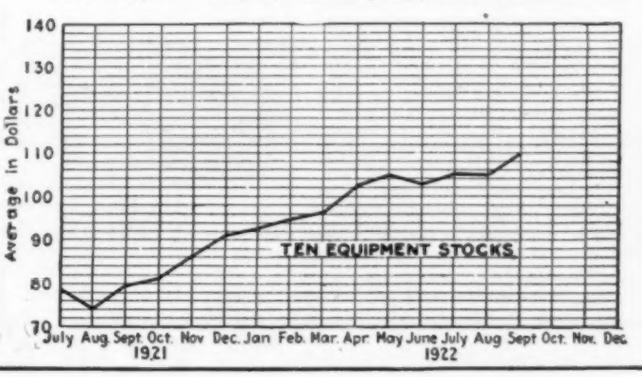
Employment in industries, according to the Department of Labor, shows that in August as compared with July, there was an increase of 0.7 per cent in foundry and machine shops. Per capita earnings in these same industries show an increase of 2.9 per cent over the July period.

Wholesale prices in the United States during August, according to the Federal Reserve Board's index, show but little, if any change over July. Using 100 as the index for 1913, August stands at 165, the same as in the month of July.

Monthly percentage of active cotton, woolen and worsted spindles to the total in place as reported by the Bureau of Foreign and Domestic Commerce.



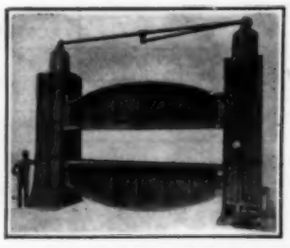
Monthly average: Am. Brake Shoe; Am. Car and Fdy.; Am. Loco.; Baldwin; Lima Loco.; N. Y. Airbrake; Pressed Steel Car; Pullman; Ry. Steel Spring; West'h'se A'Brake.



Condensed-Clipping Index of Equipment

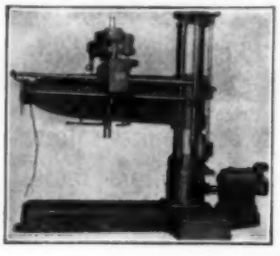
Patented Aug. 20, 1918

Press, Flanging, Hydraulic, Large
Hydraulic Press Manufacturing Co., Mount Gilead, Ohio
"American Machinist," August 3, 1922



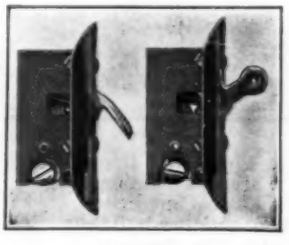
The machine is used for flanging the plates for Murphy car ends and will flange cold steel ⅜ in. thick by 10 ft. long. The press is equipped with two 20-in. diameter rams. Two auxiliary, 5½-in. diameter cylinders are used for returning the platen to the upper position. The press is capable of exerting a pressure of 435 tons. A three-way, poppet-type, high-pressure valve controls all the movements of the press, manipulated by one hand lever. Stroke, 24 in. Maximum distance between platens, 36 in. Weight, 42 tons.

Clamping Device, Power, for Radial Drilling Machine Column
Dreses Machine Tool Co., Cincinnati, Ohio
"American Machinist," August 10, 1922



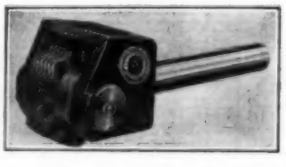
The device is for tightening the column carrying the swinging arm at each shift of the drill and is controlled from the head. No air pressure is required. The drive for the clamp is from the main vertical driving shaft which extends through the small oval box at the rear of the column. Two friction clutches in the box are incorporated in the drive, so that the screw below the box can be run either right- or left-handed for operating the binding screw. They are self-releasing and slip at either end of the movement of the tightening lever, preventing injury to the parts by over-running.

Switches, Tool-Handle, Electric
Cutler-Hammer Manufacturing Co., Milwaukee, Wis.
"American Machinist," August 10, 1922



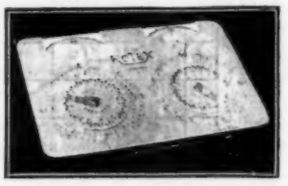
The two types of compact electric switches are for use on small tools and appliances. The momentary-contact type of switch, at the left, is for installation in the handles of such tools as portable drills. When the operator grips the tool, his forefinger rests on the trigger, thus turning on the current. The switch at the right is provided with an operating lever, but with no spring to return the lever. It is used in appliances where the switch should remain in either the off or the on position until the lever is moved to the other position. Both devices have long phosphor-bronze contacts which engage with a wiping motion.

Dresser, Grinding-Wheel, Roller Bearing, Rotary Type
Desmond-Stephan Manufacturing Co., Urbana, Ohio
"American Machinist," August 10, 1922



The tool-steel disks of the device are carried on roller bearings. A stud ¾ in. in diameter carries a cage holding the rollers of the bearing, which in turn support a bushing on which the cutters are securely fastened. The cutters are replaceable, have a corrugated form, and are 2¾ in. in diameter. The body of the device may be used either in a toolpost or on a magnetic chuck. The shank is employed to hold the dresser in a toolpost. Used on a chuck, the device is turned over so that both the top of the body and the end of the shank rest on the chuck table.

Calculator, Dimension, Rapid, "Rotex"
W. Leinert, 410 West 23rd St., New York, N. Y.
"American Machinist," August 3, 1922

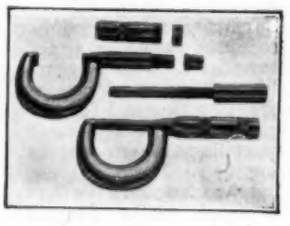


The device is for mechanically adding and subtracting fractions of an inch, inches and feet when checking a series of dimensions on a drawing. It consists of a front plate carrying two circular scales, one divided into forty-eight equal parts and the other into sixty-four parts. The former scale is used for operations involving integers of feet and inches, and the latter scale for those involving fractions of an inch. When reading the results, the number of feet is indicated on the upper gear on the left-hand side, the integers of inches on the lower disk on the left-hand side and on the upper gear on the right-hand side, while the fractions of inches are read on the lower disk at the right.

Profiling and Milling Machine, Vertical Spindle
Robbins Machine Co., 42 Lagrange St., Worcester, Mass.
"American Machinist," August 10, 1922

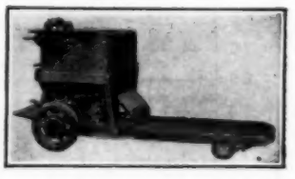
The machine has a crossfeed screw operated through helical gears from a handwheel that stands in the same plane as the traverse handle. The 1 1/16-in. diameter spindle takes a No. 3 Morse taper shank. A through hole provides for the use of a knock-out rod. The spindle runs in three parallel bronze bearings and is driven through generated bevel gears from a shaft having a four-step cone for speed changes. Work table, 16 x 30 in. Throat depth from spindle center to column face, 14 in. Table traverse, 12 in. Cross movement, 7 in. Vertical movement: knee, 6 in., spindle, 2¾ in. Floor space, 36 x 45 in. Weight, 1,100 pounds.

Micrometer, "Jaques Special"
Central Tool Co., Auburn, R. I.
"American Machinist," August 10, 1922



The frame of the micrometer is of oval section and is one piece with the barrel. The outer end of the barrel is split to provide a means of compensating for wear of the thread. The adjustment in diameter is made by the spring nut adjacent to the barrel. The thimble is a tight push fit over the sleeve of the measuring spindle. It is also split and provided with a knurled ring nut so that it may be clamped to the sleeve. The micrometer may be easily taken apart and adjusted.

Truck, Lifting-Platform, Electric-Driven, Industrial, 3-Ton
Automatic Transportation Co., 2933 Main St., Buffalo, N. Y.
"American Machinist," August 10, 1922



In this truck structural steel, hot-riveted in place, provides a rigid and durable, as well as a light, construction. The truck has a lifting capacity of three tons. The battery, the motor, the drive mechanism and the control mechanism are similar to those employed on previous models. Steel covers enclose the batteries and all of the auxiliary mechanism.

Clip, paste on 3 x 5-in. cards and file as desired

Business Items

Davis, Hoy and Stumpf, Singer Building, New York, N. Y., have recently been organized as dealers and distributors of metal-working machinery. The firm consists of Wm. F. Davis, L. J. Hoy and Charles O. Stumpf, all of whom were formerly connected with the Wm. F. Davis Machine Tool Co., New York. The concern specializes in used machinery.

The Triangle Tool and Die Co., advises that, in the future, inquiries regarding the Superlative Sash Cord Coupler and the Triangle Rapid Bench Saw should be sent to that company at 211 Smith St., Rochester, N. Y.

The Morse Chain Co., Ithaca, N. Y., has changed its Philadelphia headquarters to Franklin Trust Building, 18 South 15th St.

The Henry Furnace and Foundry Co. of Medina, Ohio, has declared the regular quarterly dividend of 1¾ per cent on the preferred stock.

The Atlantic Elevator Co. and the Albro-Clem Elevator Co. announce a consolidation under the name of the Atlantic Elevator Co. with headquarters in Philadelphia.

The C. F. Davis Machine Co., Inc., Rochester, N. Y., has moved into a new factory at 150 N. Water St., that city.

The Wilde Drop Forge and Tool Company has filed incorporation papers with the secretary of the state, showing a capital stock of $50,000 and 1,000 shares of no par value. The company will manufacture, buy and sell tools, machinery of various kinds, act as manufacturer's agents and brokers. The shareholders are Mary Wilde, Goldie Wilde and Paul Froeschl.

The Flexo Supply Co., St. Louis, Mo., has been incorporated with a capital stock of $10,000. The company will manufacture, buy and sell flexible pipe joint, known by trade mark as flex-o-kant leak, joints, piping, valves, pipe fittings, steam fittings and accessories. The incorporators are M. L. Evans, B. M. Brownell and Santon Fitzgerald, of St. Louis.

The American Radiator Co., has moved its Southern headquarters from Birmingham, Ala., to Atlanta, serving the group of six southeastern states and part of Arkansas. Thirty salesmen travel out of the Atlanta office, which is located at 232 Peachtree St., and is under the management of A. F. Westerfield.

The Turner Machine Co. has been organized and incorporated in Atlanta with $100,000 capital as machinery dealers in the southeastern territory, to handle all kinds of machinery, parts, tools, etc. The incorporators are J. T. Turner, 34 East 12th St., Atlanta, and Dr. A. M. Williamson, 24 Cooper St., Atlanta.

The P. H. Palmer Co., incorporated with $5,000 capital at Jacksonville, Fla., according to its application for charter, plans the establishment of a machine shop for marine machinery. P. H. Palmer is president, and Charles Atkins is vice-president and treasurer.

The Cincinnati Planer Co., Cincinnati, Ohio, announces a 10 per cent increase in prices on its vertical boring and turning mills, effective October 1.

The L-M Axle Co., Cleveland, Ohio, has purchased the plant of the Jones Gear Co., on Wayside Road and commenced the production of the L-M automobile axle, the invention of Leo Melanowski. Officers of the company are: George B. Durell, president; Warren H. Cowdery, chairman of the board and J. L. Vaughan, secretary.

Williams, White & Co., of Moline, Ill., have taken over the entire business of manufacturing and marketing the Osterholm automatic surface grinding machine, in addition to their present line.

The Brown Instrument Co., announces the opening on Sept. 1, of its Southern Branch, 619 Brown-Marx Building, Birmingham, Ala., with Charles L. Saunders in charge.

The Bonnot Co., Canton, Ohio, manufacturer of coal pulverizing and clay making machinery, has announced that its directors have declared the regular quarterly dividend of 1¾ per cent on the preferred stock payable Oct. 1, to stock holders of record Sept. 20.

The Rockwood Manufacturing Co., 1801 English Ave., Indianapolis, has awarded the contract for the construction of a new machine shop and the work has been started. The building will be brick, heavy mill fire proof construction, with a traveling crane.

The American Art Textile Co., Ft. Wayne, Ind., is planning a new factory addition, and will install much new equipment.

The Dudio Manufacturing Co., Ft. Wayne, Ind., will install in its new wire enameling plant, now nearing completion, equipment costing approximately $100,000. G. A. Jacobs is general manager.

The Commercial Shearing and Stamping Co., Youngstown, Ohio, has been reorganized with the following officers and directors elected: President, W. A. Beecher; vice president, G. F. Aledrice; treasurer, Nathan Folsom; secretary, Guy Ohl. The directors include the foregoing with the addition of C. B. Cushwa and George Donaldson. At a recent meeting the purchase of $30,000 worth of additional equipment was authorized.

The Seaboard Air Line has applied to the Interstate Commerce Commission for authority to create an equipment trust under which $2,560,000 of certificates, with interest of 5.5 per cent annually, will be issued. The money is to be used in acquiring three large special type Mikado engines, 2,150 rebuilt box cars, 850 rebuilt gondolas, and 100 rebuilt phosphate rock cars.

The Seybold Machine Co. directors at a recent meeting in Dayton, declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable Oct. 1, 1922, to stockholders of record Sept. 20.

The George T. Trundle, Jr. Engineering Co., 118 St. Clair Ave., Cleveland, Ohio, makes the announcement that John F. Price has been appointed its vice president. Mr. Price was formerly comptroller of the Brown Hoisting Machinery Co., Cleveland.

Frostholm Brothers, Syracuse, N. Y., manufacturers of tools and cylinder grinders have purchased a new daylight factory at 1009 S. Clinton St., in that city. New equipment is to be installed and arrangements are being made for an expansion of the business.

The Home Accessories Corporation, recently incorporated in Worcester, Mass., to manufacture bathroom fixtures and kitchen accessories, has purchased the property at the corner of Gardner and Tainter Sts., that city, where it will begin operations in the near future.

The Hartley Clock Co., Boston, which was incorporated recently with a capital of $1,300,000, will build a three-story factory in Attleboro, Mass.

The Harris Automatic Press Co. directors at their meeting in Cleveland have declared the regular 1¾ per cent quarterly dividend on the preferred stock, payable Oct. 1.

The Angle Steel Stool Co., established about eleven years ago at Otsego, Mich., moved recently to its new daylight factory at Plainwell, Mich., the steady growth of its business necessitating larger quarters. C. E. Pipp is the president and manager of the company.

The Houghton Elevator and Machine Co. directors at a recent meeting in Toledo, have declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable Oct. 1.

The Computing-Tabulating-Recording Co. has announced the purchase of a factory by the company at Villengen, Germany, for the manufacture of its products for European consumption.

The Western Pacific Railroad Co. plans to add 2,000 refrigerator cars and 100 automobile cars to its equipment, according to an application made to the Railroad Commission to issue and sell $5,000,000 for this purpose.

The Bureau of Foreign and Domestic Commerce has opened a branch office in the Witherspoon Building, Philadelphia, Pa.

The Machinery Supply Corporation is the name of a new consolidation formed in Joplin, Mo., of the Joplin Machinery Exchange and the Machinery and Supply Corporation. R. M. Clark is manager and office headquarters have been established at 211 East Fourth St. D. C. Morrow of Kansas City is president and L. G. Lebow of the United Iron Works of Joplin is vice-president.

The Mott Southern Co., Peters St. Viaduct, Atlanta, distributor of plumbing and heating supplies and fixtures in the southern territory, is amending its charter, increasing its capital stock by an additional issue of $100,000, according to Charles B. Wilson, secretary.

The Standard Sanitary Manufacturing Co. opened in Atlanta the latter part of September a southern showroom for the display of plumbing fixtures and brass goods manufactured by this concern. The Atlanta address is 281 Peachtree St.

The Nashville Bridge Co., Nashville, Tenn., has acquired a site at Bessemer, Ala., and will shortly establish a branch plant there for the manufacture of steel parts for bridges, an official of the company advises.

The Director of Sales of the War Department announces that award has been made to the Republic of Poland of 7,504 European type railway cars, consisting of 75 Guerite box cars with cabs, 529 flat cars, 1,850 low side gon-

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

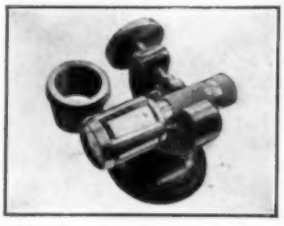
Gage, End, Test, "Everwear"
Central Tool Co., Auburn, R. I.
"American Machinist," August 10, 1922

The end gage is for testing micrometers or for use in quantity production of work requiring the accurate gaging of internal diameters. The central part, or stem, is cupped at both ends to receive a $\frac{5}{16}$-in. commercial steel ball, which is retained in place by a sleeve or cup threaded to screw on the stem. As round balls give the actual measuring contacts, the gage may be adjusted to compensate for wear by loosening the sleeves and turning the balls slightly to expose the unused portions of their surfaces. After several such adjustments the balls may be discarded and new ones substituted. The gage can be furnished in any desired length above 1 inch.

Countersinking Machine, Automatic, No. 12
Fox Machine Co., Jackson, Mich.
"American Machinist," August 10, 1922

This single purpose machine is for countersinking automobile clutch plate holes. Arranged for countersinking the fifty-two holes in Hudson clutch plates, it is a three-station, rotary-table machine with twenty-six spindles in each of two groups mounted in a single head. The speed box on the top of the column is similar to others of the same make. The feed box has but one fixed movement. A geared pump located in the head furnishes forced lubrication for the spindle bearings and the spindle head gears. Initial drive is through an automobile-type dry-disk clutch at the top of the column and controlled by a foot lever at the base of the pedestal. Weight, 2,450 pounds.

Gage and Stand, Inspection, Internal
John Bath & Co., Inc., Worcester, Mass.
"American Machinist," August 10, 1922

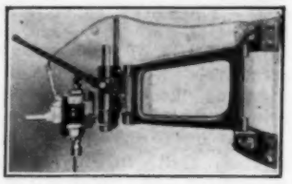


The gage is for accurately calibrating internal diameters in hardened and ground work. It is a modification of the Bath internal micrometer that measures diameters by means of a micrometer screw and sliding wedges. The tool measures variations of 0.0001 in., each mark on the thimble representing this amount. The stand grips the measuring tool by the knurled handle, which has no movement with relation to the body. Its gripping surfaces are faced with soft metal. Measuring tools can be supplied for any diameter above 1 in., and the range from one size to another can be easily made.

Saw, Bench, Portable, Patternmaker's
A. C. Sisson, 41 Bayley St., Pawtucket, R. I.
"American Machinist," August 10, 1922

The machine is for patternmakers and cabinetmakers and may be used in jobbing machine shops where woodworking is being done. It is entirely self-contained. The arbor is belt driven from a motor that can be attached to any lamp socket. A rip fence may be set at any angle for bevel sawing, and a cut-off slide is adjustable for miters up to 45 deg. An adjustable stop attaches to the cut-off slide for duplicating lengths. The arbor will carry a 6-in. saw, and runs at 2,400 r.p.m. The table may be tilted to any angle or swung up out of the way. Table: height, 38 in.; surface, $16\frac{1}{2}$ x $21\frac{1}{2}$ in. Weight, 184 pounds.

Drill, Radial-Arm, Electric, for Millwrights
Van Dorn Electric Tool Co., Cleveland, Ohio
"American Machinist," August 10, 1922

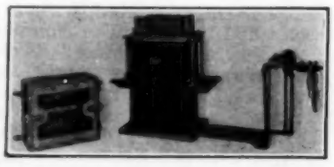


The electric drill is especially adapted to the needs of millwrights and maintenance men, and has a universal motor. The chuck holds twist drills up to $\frac{3}{4}$ in. in diameter for work in iron and steel, while larger bits can be carried for boring wood. Two brackets bolted to the wall or column carry the pivots that support the arm. At the outer end of the arm is a second pivoted joint on which the short forearm swings. The drill bracket or vertical sliding members can be operated by means of the long hand lever. The cutting tool swings within a circle having a radius of $31\frac{1}{2}$ in. from the wall pivots. The auxiliary forearm provides a secondary radius of $10\frac{1}{2}$ inches.

Saw, Jig, Self-Contained, No. 173
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," August 10, 1922

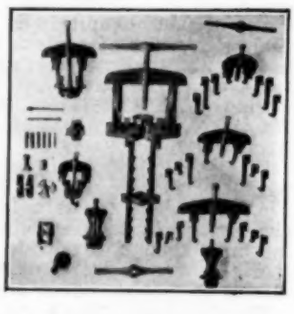
The machine is for interior and exterior scroll work in wood or other easily machined substances. No moving parts are exposed except the saw. An automatic clamping device below the table operates in conjunction with the sliding block above. The saw guides may be rotated 90 deg. in their bearings. The foot control can be operated from either position. A continuous air blast directed at the front of the saw carries away the dust. Belt drive can be provided. One dozen saws and the necessary wrenches are furnished with the machine. Table, 39 x 34 in; tilted 30 deg. right or left. Saw stroke, 3 in. Capacity, saws up to 18 in. in length.

Molding Machine, Jolt, Stripper
Arcade Manufacturing Co., Freeport, Ill.
"American Machinist," August 10, 1922



The machine has a 6-in. jolting motion operated by compressed air in the usual manner, and can be furnished with either an 8- or 12-in. length of stripping stroke. The 12-in. strip machine is placed half below the floor, but the 8-in. strip machine is placed entirely above. The flask containing the sand can be lifted straight up from the pattern, requiring only a small amount of draft. The lifting pins engaging the stripping plate or the flask are adjustable. The machine may be made with a hand-operated stripping device for small jolt cylinders. Several stripping cylinders for long flasks may be furnished.

Press, Combination Hand and Puller
Geo. W. Dover, Inc., Providence, R. I.
"American Machinist," August 10, 1922



The combination hand press and puller is for removing wheels, gears and bushings from their shafts and also for pressing them in place. Its base can be attached to the work bench. With the yoke, spreaders and anvil plate in place, it becomes an arbor press, for handling round pieces up to 18 in. in diameter. Three yokes of different lengths are supplied, each having a set of hook arms for pulling off the refractory wheels or for extracting bushings. The arms are reversible. Special hook arms remove gears and bushings from parts for certain makes of automobiles that cannot be reached with the regular equipment.

Clip, paste on 3 x 5-in. cards and file as desired

dola cars, 1,450 high side gondola cars with tarpaulin frames, and 3,600 high side gondola cars without tarpaulin frames

The F. S. Pearson Engineering Corporation, Fisk Bldg., 57th St. and Broadway, New York City, has re-established its department for industrial management and technical auditing of industries and public utilities. This department will be carried on together with the usual work of financing, developing, design and construction of engineering projects and industrial plants.

Personals

ROBERT B. GERHARDT, electrical superintendent of the Maryland plant of the Bethlehem Steel Co., Sparrows Point, was elected president of the Association of Iron and Steel Electrical Engineers at its recent convention in Cleveland.

WALTER ENOCH, formerly head of the domestic goods department of the Wickwire-Spencer Steel Corporation, Worcester, Mass., has become president and general manager of the new Home Accessories Corporation, manufacturers of bath room fixtures, of Worcester.

DAVID JULIAN, formerly connected with the E. J. Manville Machine Co., Waterbury, Conn., is now associated with the Columbus Bolt Works Co., Columbus, Ohio, as factory manager.

B. S. LEWIS of the Stanley Works, New Britain, Conn., has been elected president of the New Britain branch of the Connecticut section of the A. S. M. E.

H. I. MARKEY, associated with the sales department of the Diamond Chain and Manufacturing Co., has been appointed manager of the company's newly opened office in the *Leader-News* Building, Cleveland, Ohio.

ALBERT J. WOODRUFF, head of the Woodruff Machinery Co., Atlanta, Ga., jobber of machinery, tools and machine parts, was nominated as a member of the house of representatives from DeKalb county in the recent Georgia primary.

PHIL CARR, who spent the past year in Honolulu, Hawaiian Islands, as a representative of machine tool interests in this country, has returned to the United States and taken up work as sales manager of the Davenport Machine Tool Co., Inc., Rochester, N. Y.

W. LA COSTE NEILSON, vice-president and general sales manager of the Norton Co., Worcester, Mass., has just returned from a European trip.

ERNEST R. LLEWELLYN, of the sales department of the Greenfield Tap and Die Corporation resigned his position with that company on October 1. He has not as yet formulated plans for the future.

WILLIAM BREEDEN, sales manager of the Lackawanna Steel Co. for the past three years, has resigned. He has been with the company both at Philadelphia and Buffalo.

JOSEPH W. ROE, president of the American Society of Industrial Engineers and professor of industrial engineering in the University of New York, addressed a meeting in Springfield, Mass., Sept. 29, held in the interest of the plan to form a local body of industrial engineers to be affiliated with the national society. The purpose and advantages of the organization were explained and progress made in the arrangements, which are now in charge of a membership committee.

CHARLES U. SMITH of St. Joseph, Mich., has been appointed superintendent of the American Malleable Castings Co. plant in Marion, Ohio. Mr. Smith was formerly foundry superintendent for the Auto Specialties Manufacturing Co., in St. Joseph.

JAMES A. BUELL, assistant general manager of the United Alloy Steel Corporation, has resigned his position to become general superintendent of the Donner Steel Co., Buffalo, N. Y.

Obituary

Herbert C. Follinger, manager of the Chicago Office of the Chain Belt Co., died of pneumonia at his home in Chicago, September 27, following an illness of but a few days. Mr. Follinger was 38 years of age at the time of his death, and was born at Fort Wayne, Indiana. In 1902 he graduated from the Chicago Manual Training School, and entered the employ of the Otis Elevator Company. He became associated with the Chain Belt Co. in 1914, and in 1916 was appointed district manager for the Chicago territory.

Book Reviews

Six-Place Tables. A pocket-size (4 x 7 in.) book of 124 pages, flexible cloth covers. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $1.25.

The small volume contains in convenient form, seven sets of tables, including those on squares, cubes, square roots, cube roots, circumferences, areas, fifth roots, fifth powers, logarithms (six places) logarithmic sines, cosines, tangents and cotangents, natural tangents and cotangents and trigonometric formulas. For those who are using the tables enumerated constantly or even frequently, the book will be worth much. In addition to the value of its contents, it is well arranged and clearly printed.

Elements of Industrial Heating. By the engineers of the W. S. Rockwell Company, New York City. 44 pages, illustrated with numerous line drawings, charts and tables. Published by the W. S. Rockwell Co., 50 Church St., New York City.

"The influence of heat upon the quality and cost of practically all manufactured products, and the comparatively inefficient methods in general use, indicate the necessity of developing a broader view of the industrial heating problem. The demand for better and cheaper products can only be met with better methods of heating and handling, better equipment, and above all, men better qualified to understand and properly apply in practice the simple principles of one of the oldest and most important, though indifferently practiced, industrial arts."

There is no doubt of the tremendous importance of the problems thus outlined in the preface of this book and furthermore there is no doubt that the engineers who have prepared it has done much for industry in furnishing this well-illustrated, effective summary of important considerations in fuel application. Much of the material in this book has appeared in pamphlets previously issued, but when this material is brought together under one cover, it again emphasizes the complexity as well as the importance of the fundamental problems as these problems are seldom stressed.

One of the purposes of this new book is to bring together in convenient form for the use of chemical and mechanical engineering teachers material that may be employed as a "supplementary text book for shop training classes, vocational schools, colleges, etc., as well as for the man in the shop and others interested in the subject." Several institutions have already announced that they expect their engineering students to use this pamphlet. If this practice is extended widely, as it well may be, we may look forward to the time when engineers will think not alone of cost of fuel per ton or the relative cost of various fuels per million heat units, but rather of that important over-all efficiency, the fuel cost per unit of quality product. In bringing out the importance of that feature, this book gives attention not alone to the selection of the fuel, but also to the selection of the furnace, the placing of the material in the furnace, and the time factor in heating.

The book does not in any way argue for any single type of equipment or any particular fuel; it affords an unusually well-balanced and impartial review of the various types of heating furnaces, annealing equipment, automatic and continuous methods and the many variations of heat-applying devices that modern technology furnishes. It will be well worth while for experienced engineers as well as those beginning their studies in engineering to look through this booklet.

Machinists' and Draftsmen's Handbook. By Peder Lobben. Third edition. Four hundred eighty 4½ x 7¼ in. pages, flexible board covers. Published by D. Van Nostrand Co., 8 Warren St., New York, N. Y. Price $3.00.

A handbook is judged by its contents and by the method of their presentation. The contents in this volume include notes on mathematics, arithmetic, notes on algebra, logarithms, weights and measures, geometry, mensuration, strength of materials, mechanics, belts, rope transmission, pulleys, fly wheels, shafting, bearings, gear teeth, screws, pipes, notes on hydraulics, notes on steam, notes on copper wire, notes on electrical terms, shop notes, blue printing. In presenting the work the author has avoided the use of abstruse theories and complicated formulas. Definitions are clear and examples are well chosen. Logarithmic tables are six-place.

Factory Storekeeping—The Control and Storage of Materials. By Henry H. Farquhar. Cloth; one hundred and seventy-six 6 x 9-in. pages, illustrated. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York, N. Y. Price, $2.50.

The author, who is assistant professor of industrial management at the Harvard Graduate School of Business Administration, and is thus well qualified to write on the subject, describes a method that is practical and well worth following. He starts off with a discussion of the functions of a manufacturing plant and emphasizes the dependence of production upon material control. He ends this discussion with a summary of material losses which he claims are due to the lack of standards of variety and quality, to excessive supply, to insufficient supply and to misplaced responsibility and faulty routine.

In the chapter on material replenishment, the author gives three excellent plans for controlling supplies by the amount on hand, by the amount available or by schedule. In the next chapter are described and illustrated the balance sheets for these three plans and the information necessary for each. The duties of the purchasing department in both speculative and routine purchasing and the procedure of the receiving and inspection departments finish the discussion of material control.

The author then undertakes a description of the storeroom, dealing with the layout, equipment and storage of materials. He shows the advantages and disadvantages of a centralized storeroom, gives the details to be considered in selecting a location for the storeroom and outlines a system for indexing supplies. Several drawings of interchangeable racks and bins are shown to bring out the author's theory of double binning. His method for securing a turnover of stock is well thought out and in practice should give an efficient system of storing in regard to saving space and labor. The classification of materials and a description of material accounting, inventories and statistics finish the book.

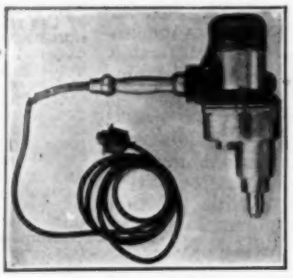
Business Analysis of United States Made by Counties. In two volumes, each consisting of an I. P. No. 2710 flexible leather binder with loose leaf index and contents. Leaves are 5½ x 8½ inches. Published by Wm. H. Rankin Co., 180 North Wabash Ave., Chicago, Ill. Price $200.

Statistics covering the following items are given by county, and by total for state: Total farm value, total crop value, total income tax, total white population, total

Condensed-Clipping Index of Equipment

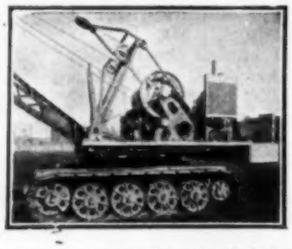
Patented Aug. 20, 1918

Screw and Nut Setting Tools, Portable and Stationary
Elecdrive Manufacturing Co., Inc., Syracuse, N. Y.
"American Machinist," August 17, 1922



The tools are used in driving and setting screws, studs and nuts, and are made in two sizes of the portable and one size of the stationary type. Motors for both types run on 110-volt d.c. or a.c., providing the a.c. is not more than 60-cycle. The portable model operates from an electric light socket, but unless the light wiring has a large enough safety factor, the stationary one should be operated from a power line. Recessed, tapered wrenches are furnished for picking up the nuts while the spindle is running at full speed. Portable tool: capacities, ¼ to 7/16 in. and ½ to ¾ in. respectively; weights, 11 and 13 lb. Stationary tool capacity, ¼ to 1 inch.

Crane, Crawler, Heavy-Duty, Motor-Driven
Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill.
"American Machinist," August 17, 1922

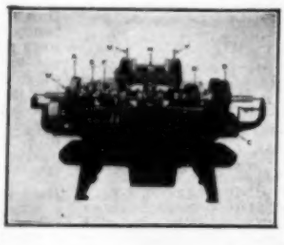


The crane, operated by a heavy-duty, 4-cylinder traction engine running at 800 r.p.m., is equipped with an automatic governor, gear-driven fan, centrifugal pump, high tension magneto with impulse starter, and force feed lubrication to all bearings. The boom-hoisting mechanism is automatically self locking. The clutches for swinging, traveling and hoisting the boom, and for hoisting and holding the drums are of the expanding type. The operator can set the brakes either before or while hoisting. A 40-hp. electric motor for any standard current can be supplied to operate the crane in place of the gasoline engine. Height, 11 ft. 8 inches.

Transformer, Electric Arc, Rivet Cutter
Electric Arc Cutting and Welding Co., 152 Jelliff Ave., Newark, N. J.
"American Machinist," August 17, 1922

The machine is adapted primarily to rivet cutting, although it can be used also for cutting cast iron, brass or bronze. It is made in three sizes. The type CW, 300-amp. machine is intended for both welding and cutting, the 600-amp. machine for rivet cutting and carbon arc welding, and the 1,000-amp. for cutting alone. A magnetically operated switch is provided in the primary, so that the circuit remains open at all times when the electrode is not in contact with the work or when the arc is not being drawn. The small pilot transformer of 100 watts capacity makes the operation automatic and positive.

Threading Machine, Automatic, Double-Ended
Cleveland Automatic Machine Co., Cleveland, Ohio
"American Machinist," August 24, 1922

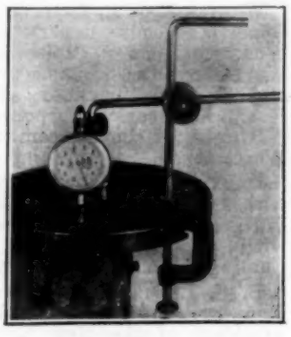


The machine is fully automatic, has two heads and is adapted to high-speed threading. It can thread simultaneously both ends of a forged or rolled staybolt, so that both threaded ends are in line and the lead is continuous from one threaded portion to the other. The machine consists primarily of a hopper, a work-feeding mechanism, a pair of floating jaws which hold the staybolt, two substantial spindles carrying the die-heads, and a large lead screw. It is equally useful for all double-ended turning and threading work on studs, pipe nipples, and short shafts. Capacity, staybolts up to 1 1/16 in. in diameter; 7 to 18 in. long.

Grinding Attachment, Combination External and Internal
United States Electrical Tool Co., Cincinnati, Ohio
"American Machinist," August 17, 1922

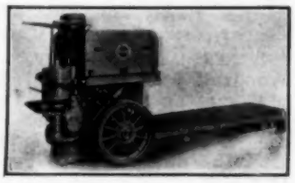
The attachment can be used on lathes with a swing as small as 10 in. The universal type motor can be operated by either d.c. or a.c. where the latter has a frequency of 60 cycles or less, and is pivoted to the angle plate. The spindle has an angle adjustment and also a vertical adjustment of 4 in., and is used for both external and internal grinding, the speed being changed by transposing the pulleys. Different lengths of wheel arbors can be inserted in the spindle. Regular equipment: three pulleys, grinding wheels for internal and external work, a wheel arbor 3 in. long, and two woven belts.

Attachment, Gage, Universal
B. C. Ames Co., Waltham, Mass.
"American Machinist," August 17, 1922



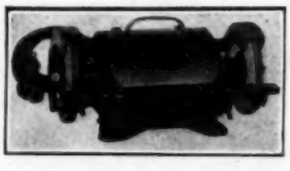
The attachment can be applied to any object within the range of the clamp and can be set so as to bring the dial gage to almost any position or angle. It can be used for testing the straightness of crankshafts, camshafts and valve cams; checking lifts of valves and valve cams; gaging thickness of piston rings, shims, bearing liners and diameters of pistons. It can be purchased without the dial gage if desired.

Truck, Platform, Elevating, 5-Ton
Atlas Car and Manufacturing Co., Cleveland, Ohio
"American Machinist," August 17, 1922



The truck is used especially in handling large core racks into and out of core ovens. The platform can be elevated 4 in. in 10 seconds. The truck may be operated by either Edison or lead batteries, the latter being standard equipment. A limit switch is operated automatically at each end of the platform travel so that the motor is stopped and the platform held in position. The brake is applied whenever pressure is released from the pedal. Three speeds are provided in each direction and steering is applied to all four wheels. The machine can be operated through intersecting aisles 8 ft. wide, while carrying a core rack 5 ft. 1 in. wide and 7 ft. long.

Grinder, Bench, Motor-Driven, "Duwell"
J. A. Finley Co., 20 Braintree St., Allston, Mass.
"American Machinist," August 24, 1922



The grinder is designed for service in machine shops and garages, for tool grinding, polishing, and wire-brushing. It carries two grinding wheels of 5-in. diameter by ½-in. face and runs at 4,500 r.p.m. Power is supplied by a universal motor of special construction running on either d.c. or a.c. and wound for 110 or 220 volts. The wheel spindle is mounted well toward the front. The machine is provided with cord, switch and attachment plug, ready for connecting to a lamp socket. Detachable wheel guards and tool rests for each wheel are also furnished. Height from base to wheel center, 3 in. Distance between wheels, 9¾ in. Weight, 25 pounds.

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manufacturing value, total state auto registration, total mileage of all roads, total surfaced roads, and certain information on climatology.

A preface lists the sources from which the data were obtained. For example, the data for the manufacturing values were taken from the 1919 Manufacturers' Bulletin, Department of Commerce, Bureau of Census. Manufacturing value is defined as the value of manufactured products, i. e., cost of material plus value added by manufacture.

Graphic Charts in Business. By Allan C. Haskell. Two hundred forty-six pages, 6 x 9 in., cloth boards. Published by Codex Book Co., Inc., 119 Broad St., New York, N. Y. Price $4.00.

Beginning with a well written chapter on the necessity for and the use of charts in business, the book progresses by gradual, easily followed steps through the definition of graphic charts and an explanation of their functions to a study of the simplest kinds of charts. The more complicated charts are then taken up, after which more than half of the book is devoted to showing how graphic charts are used in the various departments of businesses and factories, including the departments of accounting, advertising, collection, cost, credit, personnel, purchasing, sales, scheduling and production.

The kinds of charts treated are line, plain and ratio ruling, bar, circular, percentage, organization, tri-linear, probability. There is an undisputed value to graphic charts when properly executed and applied. How they may be prepared and where applied are subjects thoroughly covered and the book as a whole should be of real value in the analytical problems connected with the conducting of a business.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Iron and steel pipes of all diameters and lengths of good quality—Italy. Agency desired. Quotations, c. i. f. Italian port. Correspondence and catalogs should be in Italian or French. Reference No. 3639.

Chamotte, silica, and magnesite—Norway. Purchase desired. Quotations, c. i. f. Norwegian port. Terms, cash against documents. Reference No. 3640.

Hardware such as wood screws, wire nails, rose nails, annealed wire, and barbed and other wires; steel of every kind, anvils, etc.; railway materials; machinery; boiler fittings; electrical goods; cotton mill and gin requisites; plain and corrugated iron sheets; plain galvanized sheets; brass and copper sheets, etc.—India. Reference No. 3644.

Iron and steel bars, sheets, pipes, wire, and metals, tin plates, building forgings, tools of all kinds, engine fittings, screws, nails, tacks, rivets, and general hardware; oils and greases; varnishes and paints; leather and balata belting; cotton waste.—Finland. Purchase and agency desired. Quotations, c. i. f. Helsingfors. Terms, payment against documents. Reference No. 3665.

Sawmill machinery and accessories—Spain. Purchase desired. Quotations, c. i. f. Ferrol. Correspondence, Spanish. Reference No. 3714.

Machinery and equipment for the manufacture of candies, crackers, and biscuits—Italy. Purchase desired. Quotations, c. i. f. Genoa or Savona. Terms, cash against documents. Correspondence, French or Italian. Reference No. 3718.

Printing machinery and supplies—Italy. Purchase desired. Quotations, c. i. f. Genoa, Correspondence, Italian or French. Reference No. 3752.

Pneumatic drilling machines for mining operations—Spain. Purchase desired. Quotations, f. o. b. New York. Reference No. 3753.

Machinery for compressing calcium carbide dissolved in acetone—Spain. Purchase desired. Quotations, c. i. f. Barcelona. Payment, cash against documents. Correspondence, Spanish. Reference No. 3757.

Zinc, copper and sulphate of ammonia—Italy. Agency and purchase desired. Quotations, c. i. f. Italian port. Payment, cash against documents. Reference No. 3758.

Corrugated sheets—India. Purchase desired. Quotations, c. i. f. Karachi. Terms, cash. Reference No. 3762.

Iron kegs or drums suitable for packing stiff and liquid paints. Kegs to hold 28, 56 and 112 pounds, and drums 3, 5 and 10 gallons (imperial measure), medium-quality goods—Wales. Purchase desired. Quotations, c. i. f. Swansea or Bristol Channel port. Reference No. 3764.

Glazers' lead for vitrifying drainage pipes—Cuba. Purchase desired. Quotations, c. i. f. Caibarien. Terms, cash against draft. Correspondence, Spanish. Reference No. 3774.

Trade Catalogs

Baker Air Units. The Baker-Hansen Manufacturing Co., 1900 Park St., Alameda, Calif. This company has just issued a circular, known as Bulletin No. 201 in which is described in a comprehensive way, the Baker ball-bearing two-stage air units for oil stations, garages, tire shops, machine shops, and paint spraying machines. The publication contains illustrations of the unit with full illustrations as to its operation and maintenance.

The Tilted Turret. The Wood Turret Machine Co., Brazil, Ind. This company has just issued an instructive pamphlet on the subject of the tilted turret. The publication takes the form of questions and answers in which the many advantages of this type of turret are set forth in a clear and concise manner. Questions with their answers are also given on the precision index, the turret lock mechanism, the turret slide and saddle, spindle and bearings and automatic chuck and feed.

Portable Electric Drills. The A. F. Way Co., Inc., Hartford, Conn. This company has recently issued a new folder describing their portable electric drills. The publication contains illustrations showing construction features and a full description of the product.

Line Shafting Equipment. The Medart Co., St. Louis, Mo. This company has just issued a new condensed catalog of 192 pages with a complete index. The publication is made up in an attractive manner with numerous illustrations and line drawings and presents facts about the most generally used line shafting equipment. The aim has been to state dimensions, construction details and list prices in a way to enable engineers and designers, mechanics and power users—to plan installations and purchase the necessary requirements. The catalog forms a useful handbook with its many useful tables and is noteworthy in that no attempt is made in its pages to exploit the Medart products.

Pamphlets Received

Industrial Conditions in China. Trade Information Bulletin No. 61, prepared by the Far Eastern Division, Department of Commerce, on the present state of industrial conditions within the Chinese Empire. Distributed by the Department of Commerce, Washington, D. C.

Plan for Industrial Development of Szechwan Province, China. Trade information bulletin No. 62, prepared by the Far Eastern Division, Department of Commerce, on the state of conditions in the Chinese province of Szechwan. Distributed by the Department of Commerce, Washington, D. C.

International Association of Industrial Accident Boards and Commissions. Proceedings of the eighth annual meeting of the association, held in Chicago, September 19 to 23. This publication is known as Bulletin No. 304 of the U. S. Dept. of Labor, Bureau of Labor Statistics, from which department copies may be secured.

Foreign Trade of the United States. Trade information Bulletin No. 59 of the Department of Commerce. The bulletin is a review of the U. S. foreign trade for the fiscal year, 1921-1922. Distributed by the Department of Commerce, Washington, D. C.

Training for Foreign Service. Bulletin No. 27 of the Bureau of Education, Department of the Interior. This useful and valuable publication has been compiled by Glen Levin Swiggett and is divided into four parts as follows: Part 1, Economics; Part 2, Government; Part 3, Modern Foreign Languages and Part 4, Periodical Literature. Under each part are found numerous chapters on special phases of the subjects. Of particular value are the bibliographies to be found in the book furnishing a guide to the best works on the entire aspect of foreign service and the training therefor.

Notes on the Efficiency of Various Systems of Air Conditioning in a Munitio1 Factory. U. S. Public Haelth Service, Treasury Department, Reprint No. 729. This pamphlet has been prepared by C. E. A. Winslow, professor of Public Health, Yale School of Medicine and Leonard Greenburg, assistant sanitary engineer of the U. S. Public Health Service.

Statistical Record of the British Iron and Steel Industry. Trade information bulletin No. 66 of the Iron and Steel Division of the Department of Commerce. The bulletin contains numerous statistical tables on the state of the industry which are of considerable interest at the present time. Distributed by the Department of Commerce, Washington, D. C.

Engineering Education After The War. By Arthur M. Greene, Jr., of Rensselaer Polytechnic Institute, Troy, N. Y. This publication is known as Bulletin No. 50, Department of Interior, Bureau of Education, and contains a review of engineering study courses with changes made therein during and since the late world war.

Forthcoming Meetings

American Mining Congress, twenty-fifth annual convention, new auditorium, Cleveland, Ohio, October 9 to 14. Secretary, J. F. Callbreath, 84 Munsey Building, Washington, D. C.

Second National Aero Congress and National Airplane Races, Detroit, Mich., October 7 to 14, 1922.

American Gear Manufacturers' Association. Fall meeting, Chicago, Ill., Oct. 9, 10 and 11, 1922.

Automobile Accessories Branch of the National Hardware Association of the United States. Convention and Exhibition, Atlantic City, N. J., Oct. 16, 17, 1922. Headquarters, Hotel Ambassador, T. James Fernley, secretary-treasurer, 505 Arch St., Philadelphia, Pa.

National Hardware Association of the United States, Convention, Atlantic City, N. J. Oct. 17, 18, 19, 20, 1922. Headquarters, Marlborough-Blenheim. T. James Fernley, secretary-treasurer, 505 Arch Street, Philadelphia, Pa.

American Hardware Manufacturers' Association. Convention, Atlantic City, N. J., Oct. 18, 19, 20, 1922. Headquarters, Marlborough-Blenheim. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York.

National Association of Farm Equipment Manufacturers. Annual Convention, October 18 to 20, Congress Hotel, Chicago.

Society of Industrial Engineers. Oct. 18 to 20. McAlpin Hotel, New York. Secretary, George C. Dent, 327 South LaSalle St., Chicago.

American Manufacturers Export Association, annual convention, New York City, Oct. 25 and 26. Secretary, M. B. Dean, 160 Broadway, New York City.

American Trade Association Executives. Third annual meeting, Oct. 25, 26 and 27, 1922, at the Inn, Bucks Falls, Pa. (Delaware Water Gap).

Automotive Equipment Association. Annual show and meeting, November 13 to 18, Chicago, Ill.

National Founders' Association, Nov. 22 and 23. Secretary, J. M. Taylor, 29 South LaSalle St., Chicago, Ill.

Eighteenth Annual Automobile Salon, Commodore Hotel, New York City, December 3 to 9, 1922.

American Society of Mechanical Engineers, annual convention, December 4 to 7, 1922, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Exposition of Power and Mechanical Engineering. Dec. 7 to 13, 1922, Grand Central Palace, New York City Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Automobile Chamber of Commerce, National Automobile Show, Grand Central Palace, New York City, January 6 to 13, 1923.

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances.—Bulk of steel buying being done by railroads; 113,000 cars purchased thus far this year as against 28,000, last year. Shapes, plates and bars, $2@$2.25 f.o.b. Pittsburgh, on ordinary business, for indefinite deliveries; $2.50 per 100 lb. on plates, however, where deliveries are specified at earliest possible time consistent with rail embargoes, now holding up all but food and fuel shipments. Connellsville foundry coke up 50c. per ton.

Tin, 33c. as against 32⅜c. per lb. at New York warehouses. Lead, 6¼c. as compared with 6.15c., f.o.b. East St. Louis, last week. Aluminum ingots up ½c. per lb. in New York.

Raw linseed oil, 93c. as against 91c. per gal. (5 bbl. lots) f.o.b. New York. Market firmer; tendency upward with continued scarcity of spot oil. Lard oil market stronger; prices unchanged.

Declines—Pig-iron showing downward tendency despite higher coke prices, with increased production and falling off in demand.

Zinc, 6.7c. as against 6.86c.@6.9c. per lb., East St. Louis; 7⅜c. as compared with 7½c. at New York warehouses.

Lubricating oils show sluggish market, with large stocks on hand.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$30.55
Northern Basic	32.27
Southern Ohio No. 2	34.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	36.27
BIRMINGHAM	
No. 2 Foundry	28.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	36.64
Virginia No. 2	37.17
Basic	32.00
Grey Forge	32.00
CHICAGO	
No. 2 Foundry local	32.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	31.50
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	35.00
Basic	33.00
Bessemer	33.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Detroit	10@12	8.0	3@4
New York	9@10	6.0	4.0
Cincinnati	8.0	6 0	5@5½
Cleveland	8.0	5.25	4.5
Chicago	6.0	5.0	4.0

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2 50@2.75	4.19	3.70	4.00
No. 12	2.60@2.85	4.24	3.75	4.05
No. 14	2.70@2.90	4.29	3.80	4.10
No. 16	2.90@3.20	4.39	3.90	4.20
Black				
Nos. 17 and 21.	3.20@3.60	4.70	4.20	4.70
Nos. 22 and 24.	3.25@3.65	4.75	4.25	4.70
Nos. 25 and 26.	3.30@3.70	4.80	4 30	4.75
No. 28	3.35@3.75	4.90	4.40	4.85
Galvanized				
Nos. 10 and 11.	3.35@3.75	4.90	4.40	4.85
Nos. 12 and 14.	3.45@3.85	5.00	4.50	4.95
Nos. 17 and 21.	3.75@4.15	5.30	4.80	....
Nos. 22 and 24.	3.90@4.30	5.45	4.95	5.40
No. 26	4.05@4.45	5.60	5.10	5.55
No. 28	4.35@4.75	5.90	5.40	5.95

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD					
1 to 3	68	56½	⅜ to 1¼	34	19
LAP WELD					
2	61	49½	2	29	15
2½ to 6	65	53½	2½ to 4	32½	19
7 to 8	62	49½	4½ to 6	32½	19
9 to 12	61	48½	7 to 12	30	17
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	66	55½	⅜ to 1¼	34	20
2 to 3	67	56½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	59	48½	2	30	17
2½ to 4	63	52½	2½ to 4	33	21
4½ to 6	62	51½	4½ to 6	32	20
7 to 8	58	45½	7 to 8	25	13
9 to 12	52	39½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded.	60%	47%	57½%	45½%	62½%	48½%
2½ to 6 in. steel lap welded.	57%	44%	55½%	42½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 5%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.39	3.71	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	2.92½
Soft steel bars (base)	3.04	2.91	2.82½
Soft steel bar shapes (base)	3.04	2.91	2.82½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	2.92½
Bar iron (2.60 at mill)	3.04	2.91	2.82½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
5/32	8.00		12@13
⅛	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York	14.75		
Tin, 5-ton lots, New York	33.00		
Lead (up to carlots), St. Louis 6.25; New York	6.75@6.87½		
Zinc (up to carlots), St. Louis 6.70; New York	7.37½		
Aluminum, 98 to 99% ingots, 1-15 ton lots	20.70	21.00	20.00
Antimony (Chinese), ton spot	7.25@7.37½	8.00	8.00
Copper sheets, base	21.50	22.00	23.00
Copper wire (carlots)	16.00	18.00	16.25
Copper bars (ton lots)	20.00	23.00	19.50
Copper tubing (100-lb. lots)	24.75	25.00	23.00
Brass sheets (100-lb. lots)	18.50	20.75	18.75
Brass tubing (100-lb. lots)	23.00	24.00	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	18.75	15.75
Brass wire (carlots)	19.00	20.75	.....
Zinc sheets (casks)	9.25	10.25	.....
Solder (½ and ¼), (caselots)	25.00	23.50	20.00
Babbitt metal (83% tin)	34.00	42.25	36.00
Babbitt metal (35% tin)	25.00	16.00	9.00
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J	39.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.50	12.00
Copper, heavy, and wire	11.75	12.00	11 50
Copper, light, and bottoms	9.75	10.00	10.50
Lead, heavy	4.75	5.25	4.75
Lead, tea	4.25	4.25	4.00
Brass, heavy	7.00	6.50	9.25
Brass, light	6.00	5.50	6 00
No. 1 yellow brass turnings	6.50	7 00	7.00
Zinc	3 00	4.00	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11½
Cotton waste, mixed, per lb.	.065@.10	.09	.08
Wiping cloths, 13½x13½, per lb.	.075	.06	.10
Wiping cloths, 13½x20½, per lb.	.08	.096	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.93	1.01	.97
White lead, dry or in oil	100 lb. kegs.	New York, 12.75	
Red lead, dry	100 lb. kegs.	New York, 12.75	
Red lead, in oil	100 lb. kegs.	New York, 14.25	
Fire clay, per 100 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	11.50@12.50	
Coke, prompt foundry, Connellsville	per net ton	13.50@14.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	40%	50-10-5%	50%
1¼ and 1½x3 in. up to 12 in	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in	30%	40–10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.50	5.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, $\frac{7}{16}$ in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.35
Cone heads, ditto (net)	5.10	4.00	3.45
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55–5%	50%	50%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	40-5%	40½%	50%
Heavy grade	30-5%	30–5%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	1 24	1.40
Cloth	3.02	2 67	3.20

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—Hamler Boiler Tank Co., 6025 West 66th St., one horizontal pyramid type plate bending roll, 12 ft. between housings, drop housings with power lift, 1 in. plate capacity, arranged for motor drive; also similar machine, 16 ft. between housings.

Ill., Chicago—J. Hess, 1219 South Western Ave., (machine shop)—one double crank geared blanking press.

Ind., Indianpolis—Indiana Battery Service Co., 1007 North Meridian St., H. Churchman, Pres.—electrical machinery, tools and equipment for 1 story service and repair shop for electrical automobiles and automotive equipment.

Ind., Michigan City—The Super Range Co., R. L. Poe, Purch. Agt.—machine tools and foundry equipment for the manufacture of stoves and ranges.

Ia., Ottumwa—Hardsoeg Mfg. Co. (manufacturer of mining tools)—one press for forging pick eyes, about 60 in. between uprights., die space approximately 20 x 60 in., distance between slide and bed with stroke down and adjustment up, 20 in., stroke 6 to 8 in., diameter crank 8 in., press shearing attachment preferred.

Md., Baltimore — Beckerly-Trusler Co., 306 Stewart Bldg.—one 20 in. metal lathe.

Mich., Detroit—Base-O-Lite Products Co., 114 Woodbridge St., E.—bench, tap and drill, motor driven, vertical and reversible.

Mo., St. Louis — The Modern Specialty Co., 8 North 16th St. (machine shop)—spring making machinery and spring winding machine, power equipment.

N. Y., New York—McCall Co., 236 West 37th St., (publishing plant) A. Dudley, Purch. Agt.—one 24 x 12 in. engine lathe, 9 ft. between centers.

O., Cleveland—Star Machine & Tool Co., 433 Champlain St.—one small punch press.

O., Columbus—Columbus Auto Parts Co., 215 East Russell St., R. E. Klages, Pres.—automatic milling machine and screw machine.

O., Columbus—Jaeger Machine Co., 520 Dublin Ave. (manufacturer of machines and concrete mixers), G. Jaeger, Pres.—one 30 in. vertical boring machine and one 21 or 24 in. turret lathe.

O., Uhrichsville—Gallagher Bros.—additional machine shop equipment.

Pa., Palmerton — Horlachers Garage — machine and repair shop equipment for new garage.

Pa., Pittsburgh—The Fairmont Creamery Co., 301 Ferry St.—garage and repair shop equipment, also mechanical equipment for proposed $150,000 garage and warehouse on 26th and Smallman Sts.

R. I., Providence—The Hope St. Garage Co., 825 Hope St.—machinery and equipment for proposed garage and service station.

Tenn., Chattanooga — Hamilton Mchy. Co., 204-208 Market St.—one 72 in. open side planer, having 12 to 16 ft. bed, (used).

W. Va., Wheeling—Centre Fdry. & Machine Co., 2011 Main St.—foundry and machine shop equipment.

Wis., Appleton—P. Rademacher, 801 Superior St.—automobile repair machinery for proposed garage.

Wis., Colby—Colby Buick Co., H. J. Cornelius, Mgr.—automobile repair machinery for proposed garage.

Wis., Eau Claire—W. A. Craig, 410 Galloway St.—automobile repair machinery.

Wis., Janesville—The Bower City Machine Co., 759 McKey Blvd.—machinery and equipment for proposed machine shop.

Wis., Marinette—C. Anderson & Son, Cook and Merryman Sts. (manufacturer of brick conveyors)—additional machine tools for proposed factory and machine shop.

Wis., Milwaukee—The Radio Garage, Inc., c/o K. Fleming, 473 12th St.—repair shop machinery, including lathe, etc.

Wis., Milwaukee—The Uecke Motor Car Co., c/o E. Uecke, 1412 9th St.—repair shop equipment including drill press.

Wis., Slinger — L. A. Burg—automobile repair machinery for proposed garage.

Wis., West Bend—Amer. Service Garage Co., M. A. Johannes, Mgr.—automobile repair machinery.

Ont., Delhi—J. E. Stedelbauer—complete equipment for proposed garage and automobile repair shop.

Ont., Petrolea—Peninsular Sugar Co.—complete machine shop equipment.

Ont., St. Thomas—Lorne Tractors, Ltd., H. Carmichael, Mgr.—tools and metal working equipment for plant at Tillsonburg.

Que., Montreal—J. Linssen, 600 Dorchester St., W.—one 12 in. engine lathe and one swing and drill press.

Machinery Wanted

Ark., Mountain Home—W. Wolf—machinery and equipment for proposed cold storage and refrigeration plant.

Conn., Middletown—Burns Lace Mfg. Co.—two 54 x 60 in. extractors and two starch mangles.

Ga., Atlanta—Hightower Box and Tank Co., T. H. Trent, 40 Queen St., Secy.—special machines for the manufacture of bottle boxes and other lock corner boxes; also other general woodworking machines, total cost $30,000.

Ga., Gainesville—W. Taffar—machinery and equipment for show case manufacturing plant at Athens.

Ill., Chicago—E. M. Heller & Co., 144 West Kinzie St.—hydraulic lard press, meat cutter, copper kettles and belting.

Ill., Chicago—Western Newspaper Union, 210 South Desplaines St.—one Cox duplex, 8 page printing press.

Ill., Joliet—J. Argo, 405 Grant Ave. (iron company)—compressor and pressure tank.

Ind., Logansport—The Universal Burner Co. (manufacturer of liquid fuel burning equipment)—air compressors and steam pumps.

Ind., Plymouth—Bd. Educ.—vocational equipment for proposed high school.

Ky., Louisville—Axton-Fisher Co., 811 South 20th St.—machinery and equipment for proposed addition to tobacco factory.

Ky., Louisville—R. C. Wayne Supply Co., 608 West Jefferson St.—one 20 ton, 8 wheel locomotive crane with reversible engine.

Md., Salisbury—Salisbury Ice Co., J. Price, Pres.—machinery and equipment for 6,000 ton ice handling plant.

Mass., Boston—Advance Printing Service Co., 78 Portland St.—hand press, card cutter, also lever pipe cutter (used).

Mass., Boston—The Amer. Net & Twine Co., 575 Atlantic Ave.—machinery for proposed factory at West Kennebunk, Me.

Mass., Cambridge—American Oil Co. (oil refiners)—used rubber mill and vulcanizing press for experimental purposes.

Mass., Malden—G. O. Smith—knitting machines for the manufacture of men's neckties.

Mass., Ware—Ware River News—remelting furnace, about 300 lbs., ingot molds.

Mich., Detroit—The Gray Motor Co., Mack Ave.—miscellaneous equipment for manufacturing and assembling automobiles.

Mich., Laingsburg—Press (newspaper)—linotype.

Mo., Kansas City—C. P. Shipley, 1627 Genesee St. (machine shop)—air compressor and a Deming duplex power pump for oil burner.

N. J., Newark—Kreuter & Co., 563 18th Ave. (machinists)—exhauster having 16 in. inlet.

N. J., Newark—The Newark Umbrella Frame Co., 359 Ogden Ave.—automatic machine for the manufacture of 7 and 8 notch umbrella parts.

N. Y., Buffalo—Buffalo Pattern Wks., 1445-1447 Niagara St.—machinery and equipment for pattern works to replace that which was destroyed by fire.

N. Y., Buffalo—C. J. Heimerle, 37 Orange St.—machinery for light manufacturing and for the manufacture of automobile parts.

N. Y., Buffalo—King Electric Mfg. Co., 1681 Fillmore Ave.—one 25 cycle, 110 volt, not less than 5 kw. spot welder.

N. Y., Buffalo—A. Leising, 19 Greenfield St.—bakeshop equipment.

N. Y., Buffalo—M. E. Lamkin, 586 Masten St.—equipment for tinsmith shop.

N. Y., Buffalo—G. V. Patrick, 514 Elmwood Ave.—equipment for proposed wholesale and retail bakery.

N. Y., Buffalo—W. A. Schneggenberger, 212 Hertel Ave.—cutting machinery and equipment for proposed junk and iron metal scrap plant.

N. Y., Gouverneur—Aldrich Paper Co., N. R. Caswell, Pres.—machinery and equipment for proposed $40,000 addition to paper factory.

N. Y., Jamestown—The Alliance Furniture Co., 615 Allen St.—machinery and equipment for proposed addition to factory.

N. Y., Jamestown — Jamestown Lounge Co., 40 Winsor St.—machinery and equipment for proposed addition to factory.

N. Y., Jamestown—Liberty Upholstery Co., Inc., Martyn Bldg., F. R. Nelson, 6 Seneca St., Pres.—woodworking machinery and equipment for the manufacture of living room furniture.

N. Y., New York—J. C. Bossong Co., 88 Franklin St. (manufacturer of hosiery)—several Scott and Williams machines, 176-200-220 needle gauge.

N. Y., New York—Hickman Mfg. Co., 70 Cortlandt St., A. W. Beil, Purch. Agt.—small stone crusher and road scraper.

N. Y., Rochester—A. T. Crapsey Co., Atlas Bldg., Elm St., E. G. Starry, Secy. and Treas.—machinery and equipment for proposed addition to clothing manufacturing plant.

N. Y., Syracuse—The United States Hoffman Mchy. Co., 729 Temple St. (manufacturer of clothes pressing machines, etc.)—complete machinery and equipment for addition to factory.

N. Y., Tonawanda—National Roofing Co., Fillmore St.—machinery and equipment for proposed $250,000 plant, for the manufacture of roofing at Chattanooga, Tenn.

N. C., Marion—Marion Knitting Mills—sixty 176 needle Scott & Williams knitting machines, models B-3 or B-5.

O., Asheville—Asheville Fireproof Co., J. Dum, Pres.—machinery and equipment for proposed plant for the manufacture of hollow tile and brick.

O., Cleveland—Lyons Bros., 983 East 152nd St.—power hammer, 300 or 400 lb. capacity, (used).

O., Cleveland — Western Newspaper Union, 1279 West 3rd St.—one 10 x 15 in. and one 12 x 18 in. job press, also paper cutter for power equipment.

O., Columbus—Grumman & Moyer Co., 286 South Greenwood Ave. (manufacturer of furniture, boxes, crates, etc.) — wood working machinery, saws, planers and shapers.

O., Columbus—O. Harmon, 523 Carpenter St., (printer)—8 x 12 in. and 10 x 15 in. printing press, 22 in. paper cutter for power equipment.

O., Columbus—Weinman Pump Mfg. Co., 284 Spruce St., W. N. Weinman, Pres.—machinery for addition to plant (new).

O., Fremont—Fremont Metal Body Co.—machinery and equipment for proposed factory, for the manufacture of metal automobile bodies, etc.

O., Lima—Vapo Stove Co.—machinery and equipment for proposed stove factory.

O., Ravenna—F. H. Phillips & associates, c/o Chamber of Commerce—machinery and equipment for automobile body plant.

O., Warren—Clark Knitting Co., 37 Walnut St., E. E. Clark, Secy. and Gen. Mgr.—machinery for hosiery knitting mill.

Okla., Bartlesville—Black, Sivalls & Bryson, Inc., J. A. Sivalls, Secy.—machinery and equipment for proposed addition to tank erecting shop in Rocky Mountain section.

Okla., Henryetta—O'Neil Petroleum Co., Box 548—pumping power outfit suitable for pumping number of wells on a 40 acre site.

Pa., Bath—Bd. of Educ.—vocational equipment for proposed school.

Pa., East Smethport—Smethport Aceton Co.—machinery and equipment for acid chemical works, to replace that which was destroyed by fire and explosion.

Pa., Natrona — School Districts of the Boro. of Brackenridge, and Twp. of Harrison, c/o F. M. Hathaway, 54 Garfield St.—equipment for manual training department.

Pa., Packerton—Packer Silk Mills—machinery and equipment for branch silk factory at Leighton.

Pa., Pittsburgh—Jones & Laughlin Steel Co., 3rd Ave. and Ross St.—one 50 ton crane with 10 ton auxiliary, for power house, Eliza furnace, two 5 ton and one 15 ton cranes for South Side Wks.; cranes, ladles and other equipment for Aliquippa Wks.

Pa., Pittsburgh — Meyers Printing Co., 6309 Broad St.—saw trimmer and other printing equipment.

Pa., Pittsburgh—Open-Hearth Fire Brick Co., 1407 Keenan Bldg. (manufacturer of sleeves, runners, nozzles, runner brick and silicia brick), H. O. Williams, Purch. Agt.—machinery and equipment for plant at Freeport.

Pa., Pittsburgh—The Union R.R. Co., Carnegie Bldg.—600 ton wheel press.

Pa., Pittston—Hilllside Coal & Iron Co.—special machinery for equipping new coal colliery with wet jig process of separating coal and slate.

Pa., Reading—The Reading Rubber Co.—$20,000 worth of machinery and equipment for tire and rubber plant at Kutztown.

S. C., Rock Hill—The Anderson Motor Co.—two Rabbit No. 4 planers.

Tenn., Maryville—Ideal Hosiery Mills—several 220 needle, 3½ cylinder Banner machines, also ribbers and loopers.

Tex., Deweyville—Peavy-Moore Lumber Co.—sawmill machinery and power house equipment.

Tex., Winfield—Lignite Coal Co.—second motion hoisting engine, with a 10 x 12 cylinder.

Va., Lynchburg—C. M. Guggenheimer (newspaper publisher)—one 12 x 18 in. Gordon press.

Va., Richmond—News-Leader Publishing Co. (newspaper)—2 super special Howe printing presses and 15 linotype machines.

Va., Richmond—Richmond, Fredericksburg & Potomac R.R., Union Sta., R. J. Rouse, Purch. Agt.—washout system for coaling plant, requiring pump and tanks, also complete outfit for blacksmith shop, including forges, air compressors, engine boiler, drill and lathe.

W. Va., New Martinsville — Universal Concrete Products Co.—air compressor.

Wis., Appleton—Traas Candy Co., 865 College Ave.—candy making machinery and equipment.

Wis., Green Bay—Fort Howard Paper Co., South State St.—special paper finishing machinery.

Wis., La Crosse—E. D. Hunt, 909 State St.—laundry machinery.

Wis., Marinette—C. Anderson & Sons, Cook and Merryman Sts.—special tools, power machinery and machines for the manufacture of brick conveyors.

Wis., Milwaukee—Ideal Shoe Mfg. Co., 1115 4th St., C. Ortgiesen, Purch. Agt.—shoe working machinery, individual motors.

Wis., Milwaukee—O. J. Koch Co., 2825 Grand Ave.—machinery for candy making.

Wis., Milwaukee—F. Kraning, 1147 Forest Home Ave.—gas storage tanks and pump for proposed addition to garage.

Wis., Milwaukee—I. Lecy, 946 26th Ave., (woodworker)—medium sized planer.

Wis., Neenah—The Valley Paper Mills, 145 West Wisconsin Ave.—machinery for proposed paper mill.

Ont., Brantford—The city, F. P. Adams, City Engr.—concrete mixer and material unloading equipment.

Ont., Burford—Burford Knitting Mills, W. Burgess, Mgr.—special knitting mill equipment for proposed plant at Simcoe.

Ont., Hanover—The Peninsular Cord Tire Co., W. A. Oakley, Mgr.—special tire and rubber manufacturing equipment.

Ont., Night Hawk Lake (Timmins P. O.) The Peninsular Mines—equipment for 200 ton mill (gold mining).

Ont., Tavistock—Ratz & Sons—machinery and equipment for flour mills, to replace that which was destroyed by fire.

Que., Montreal—J. A. Ritchie & Co., 140 Clarke St., A. James, Purch. Agt.—pulverizer, high speed, for grinding.

Mex., Tampico—Mexican Petroleum Co.—machinery and equipment for gasoline manufacturing plants in the Cerro Azul and Chapopote petroleum fields.

Metal Working Shops

Calif., Oakland—A. Kahn, Archt., 1000 Marquette Bldg., Detroit, Mich., is receiving bids for the construction of a 2 story, 80 x 684 ft. factory, on Hillside Ave. and 72nd St., here, for the Chevrolet Automobile Co., Foothill Blvd. and 69th Ave. Estimated cost $250,000. Noted Sept. 28.

Calif., San Francisco—The Bothin Real Estate Co., 604 Mission St., awarded the contract for the construction of a 3 story garage on Natoma, Hunter and Sherwood Sts. Estimated cost $45,000. Noted Sept. 14.

Calif., San Francisco — The Brumfield Electric Sign Co., 18 7th St., awarded the contract for the construction of a 1 story, 75 x 85 ft. and 25 x 80 ft. electric sign manufacturing plant, on Folsom St. near 6th St. Estimated cost $12,000. Noted May 18.

Calif., San Francisco—Crest View Apartments, Inc., c/o J. L. Stewart, Archt., Claus Spreckels Bldg., is having preliminary plans prepared for the construction of a 1 story garage on Washington St., near Gough St.

Calif., San Francisco—L. Skerl, 298 11th St., will build a 2 story factory for heavy sheet metal work, on Folsom St. near 11th St. Estimated cost $5,000. Private plans.

Calif., Watsonville — Watsonville High School District has had preliminary plans prepared for the construction of a machine shop building on the high school grounds. Wyckoff & White, Growers Bank Bldg., San Jose, Archts.

Conn., Norwalk—Meeker Union Fdry., 34 Smith St., awarded the contract for the construction of a 1 story addition to its plant. Estimated cost $10,000. Noted July 6.

Ill., Chicago—F. G. Arnold Co., c/o Z. E. Smith, Archt., 304 East 55th St., awarded the contract for the construction of a 1 story, 75 x 160 ft. garage at 3725-29 Ogden Ave. Estimated cost $50,000.

Ill., Chicago—F. Gustafson, 5724 Kenmore Ave., awarded the contract for the construction of a 1 story, 109 x 200 ft. garage, at 405-423 East Erie St. Estimated cost $80,000.

Ill., Chicago—The Pullman Co., 101st St. and Corliss Ave., awarded the contract for the construction of a 1 story, 200 x 250 ft. foundry addition. Estimated cost $600,000.

Ill., Oak Park—Davis & Kramer, Archts., 400 North Michigan Ave., Chicago, are receiving bids for the construction of a 1 story, 100 x 122 ft. garage, on Madison St. and East Ave., here, for J. F. Stacey, c/o architects. Estimated cost $50,000.

Ind., Evansville — The Fellwock Motor Co., 3 U 4th St., is having plans prepared for the construction of a 2 story service station. Estimated cost $60,000. C. Shopbell, Furniture Bldg., Archt.

Ind., Fort Wayne—The General Electric Co., Bway. and Wall St., plans to build a 1 story, 100 x 150 ft. tank shop and garage. Estimated cost $30,000. Private plans.

Ind., Indianapolis—The Indiana Battery Service Co., 1007 North Meridian St., awarded the contract for the construction of a 1 story, 60 x 200 ft. automobile service station. Estimated cost $30,000. Noted Oct. 5.

Ind., Indianapolis—The Rockwood Mfg. Co., 1801 English Ave., awarded the contract for the construction of a 1 story, 75 x 100 ft. machine shop. Estimated cost $40,000. Noted Oct. 5.

Ind., Richmond—The Automotive Gear Co. will build a 1 story, 400 x 600 ft. gear factory. Estimated cost $35,000. Noted Sept. 7.

Mass., Springfield—G. H. Chaplin, 374 Main St., awarded the contract for the construction of a 3 story, 80 x 120 ft. garage on Harrison Ave. Estimated cost $100,000.

Mass., Worcester—The Home Accessories Corp., Gardner and Tainter Sts., will soon award the contract for the construction of a 2 story, 45 x 112 ft. addition to its factory, for the manufacture of bath room fixtures. Estimated cost $35,000. Private plans.

Mich., Dearborn—A. Kahn, Archt., 1000 Marquette Bldg., Detroit, will soon award the contract for the construction of a 1 story, 202 x 804 ft. and a 2 story, 51 x 235 ft. engineering laboratory, on Oakwood Blvd., here, for Ford Motor Co., Highland Park. Estimated cost $250,000. Noted Oct. 5.

Mich., Detroit—Gray Motor Co., Mack Ave. and Railroad St., awarded the contract for the construction of a 1 story, 200 x 550 ft. automobile factory. Estimated cost $200,000.

Mich., Detroit—The Maxwell Motor Co., 12200 East Jefferson St., awarded the contract for the construction of a 1 story, 80 x 440 ft. factory. Estimated cost $200,000.

Minn., Minneapolis—T. R. McKenzie, 1050 Plymouth Bldg., has had plans prepared and will soon receive bids for the construction of a 1 story, 154 x 164 ft. garage and store building, at 2628 Hennepin Ave. Estimated cost $50,000. P. O. Moe, 1037 Plymouth Bldg., Archt.

N. J., Trenton—The Mercer County Board of Freeholders awarded the contract for the construction of a 2 story garage and warehouse. Estimated cost $31,000. Noted Sept. 21.

N. Y., Brooklyn — The Court Heights Realty Co., c/o J. Lubroth, Archt., 44 Court St., awarded the contract for the construction of a 2 story, 55 x 205 ft. garage at 22 Concord St. Estimated cost $75,000.

N. Y., Jamestown—The Watson Mfg. Co., 63 Taylor St., manufacturer of window and door screens, awarded the contract for the construction of a 4 story addition to its factory. Estimated cost $25,000. Noted Aug. 29.

N. Y., Mount Kisco—The Westchester Lighting Co., 1st Ave., Mount Vernon, awarded the contract for the construction of a 1 story automobile service and repair building, here. Estimated cost $50,000.

N. Y., Tonawanda—The National Roofing Co. plans to rebuild portion of its factory which was recently destroyed by fire. Estimated cost $5,000. Architect not announced.

N. Y., White Plains—The New York Telephone Co., 15 Dey St., New York City, is having plans prepared for the construction of a 2 story, 155 x 205 ft. automobile service and repair building, on White Plains Rd., here. Estimated cost $200,000. McKenzie, Voorhees & Gmelin, 342 Madison Ave., New York City, Engrs. and Archts.

Pa., Phila.—T. Bardaro, 57 East Vine St., will soon receive bids for the construction of a 2 story, 32 x 90 ft. and 18 x 24 ft. garage, at 5611 Vine St. Estimated cost $50,000. F. N. Greisler, 1035 Walnut St., Archt.

Pa., Phila.—Osmond & Keene, 1619 Sansom St., awarded the contract for the construction of a 1 story, 89 x 125 ft. and 25 x 29 ft. garage, on Greene St. and Queen Lane. Estimated cost $70,000.

Pa., Pittsburgh—The Equitable Gas Co., Phila. Co. Bldg., awarded the contract for the construction of a 1 story, 50 x 164 ft., 50 x 140 ft. and 15 x 20 ft. repair and machine shop on Reedsdale St.

Pa., Pittsburgh—Hubbard & Co., Granite Bldg., manufacturer of shovels, is having plans prepared for the construction of a 1 story addition to its plant on 63rd and Butler Sts. Private plans.

Pa., Pittsburgh—The Neely Nut & Bolt Co., 26 South 22nd St., is having plans prepared for the construction of a 1 story, 120 x 150 x 173 x 210 ft. addition to its plant. Private plans.

Pa., Pittsburgh—The Stroh Steel Hardening Process Co., Westinghouse Bldg., will build a 1 story, 68 x 100 ft. steel foundry and machine shop on Chateau and Ridge Sts. Estimated cost $250,000. V. S. Cruze, c/o owner, Engr. Noted Sept. 7.

Pa., Sharpsburg—L. Z. Hodil, 88 Bridge St., awarded the contract for the construction of a 1 story, 95 x 140 ft. garage, on Main St. Estimated cost $40,000.

R. I., Providence—The Hope St. Garage Co., Inc., 825 Hope St., awarded the contract for the construction of a 1 story garage and service station on 4th and Hope Sts. Estimated cots $50,000. Noted Sept. 21.

Tex., Dallas—The Southern Wire & Iron Mfg. Co., Harwood and Santa Fe Sts., plans to build a wire factory, consisting of 4 units. Cost will exceed $50,000. Architect not announced.

W. Va., Clarksburg — The Carmichael Motor Co. is having preliminary plans prepared for the construction of a 2 story, 83 x 126 ft. garage on 6th St. Estimated cost $65,000. E. J. Wood & Son, Lowndes Bldg., Archts.

W. Va., Weirton—The Weirton Steel Co. awarded the contract for the construction of eight 1 and 2 story steel sheet mills. Estimated cost $1,500,000.

Wis., Janesville—The Bower City Machine Co., 759 McKey Blvd., awarded the contract for the construction of a 1 story, 50 x 90 ft. machine shop. Estimated cost $40,000.

Wis., Marinette — C. Anderson & Son, Cook and Merryman Sts., manufacturer of brick conveyors, will build a 2 story, 36 x 75 ft. factory and machine shop, on Main St. Estimated cost $10,000. Private plans.

Wis., Milwaukee—A. G. Wolff, Archt., 453 Mitchell St., is receiving bids for the construction of a 2 story, 40 x 80 ft. addition to garage, for F. Kraning, 1147 Forest Home Ave. Estimated cost $40,000.

Wis., New Diggings—The Imperial Mining Co. will build a 2 story, 75 x 190 ft. zinc mill.

Wis., Slinger—L. A. Burg is receiving bids for the construction of a 1 story, 60 x 90 ft. garage. Estimated cost $40,000. Private plans.

Ont., Delhi—J. E. Stedelbauer plans to rebuild his garage and automobile repair shop which was destroyed by fire. Estimated cost $40,000.

Ont., Niagara Falls — Davidson & Williams, Chippewa, awarded the contract for the construction of a 2 story, 40 x 100 ft. garage. Estimated cost $25,000. Noted Sept. 21.

General Manufacturing

Ariz., Phoenix—The Southwest Portland Cement Co., 356 South Spring St., Los Angeles, is having plans prepared for the construction of a cement plant, here. Estimated cost $1,500,000. Private plans.

Colo., Denver—The Denver Custom Garment Co., 1517 Lawrence St., is having plans prepared for the construction of a 2 story, 60 x 125 ft. office and factory building. Estimated cost $75,000. H. W. J. Edebrook, Colorado Theatre Bldg., Archt.

Ill., Chicago—A. S. Alschuler, Archt., 28 East Jackson Blvd., is receiving bids for the construction of a 4 story furniture factory, on George St. near Crawford St., for the Valentine-Seaver Co. Estimated cost $400,000. Noted Sept. 14.

Ill., Chicago—Olson Rug Co., 32 Laflin St., is having plans prepared for the construction of a 5 story, 84 x 187 ft. factory. Davidson & Weiss, 53 West Jackson Blvd., Archts.

Ill., Chicago—The Purity Packing Co., 3247 West 47th St., awarded the contract for the construction of a 2 story, 100 x 125 ft. canning factory. Estimated cost $100,000.

Ind., Elkhart—The Curtain Supply Co. is having plans prepared for the construction of a 1 story, 172 x 400 ft. curtain factory. Estimated cost $100,000. Muncie & Jenson, 38 South La Salle St., Chicago, Archts.

Ind., Ft. Wayne—The American Art Textile Co. plans to build a 2 story addition to its textile plant. Estimated cost $27,000. Architect not selected.

Ind., Fort Wayne—The Wayne Oil Tank & Pump Co., Anthony Hotel, is having plans prepared for the construction of a 1 story, 50 x 320 ft. paint factory. Estimated cost $40,000. Austin Co., 208 South La Salle St., Chicago, Archts.

Ind., Hammond — The Hammond Dairy Co. is receiving bids for the construction of a 2 story, 55 x 70 x 153 ft. creamery at 680 Oakley Ave. Estimated cost $100,000. A. C. Berry & Co., Ruff Bldg., Archts. Noted Oct. 5.

Ind., Hammond—The Hydrox Co., 24th St. and Lake Park Ave., Chicago, is having plans prepared for the construction of a 3 story ice cream plant on Hohman St., here. Estimated cost $100,000. The McCormick Co., Inc., Century Bldg., Pittsburgh, Pa., Archts.

Ind., Hammond—H. J. Postlewaite, c/o M. Turner, Archt., 633 Hohman St., is receiving bids for the construction of a 2 story, 45 x 100 ft. printing plant. Estimated cost $25,000. Noted Sept. 14.

Ind., Indianapolis — Fra-Rose-Cleaners, 30th St. and Central Ave., are having plans prepared for the construction of a 2 story, 41 x 111 ft. cleaning plant. Estimated cost $25,000. T. A. Winterrowd, American Central Life Bldg., Archt.

Ind., Indianapolis—The United States Encaustic Tile Wks., 349 West 16th St., is having plans prepared for the construction of a 2 story, 90 x 100 ft. factory. Estimated cost $30,000. S. A. Hastings, c/o owner, Archt.

Ind., Jasper—The Hoosier Desk Co. is having plans prepared for the construction of a 3 story, 60 x 200 ft. addition to its furniture factory. Estimated cost $40,000. C. A. Shopbell, Furniture Bldg., Evansville, Archt.

Ind., South Bend—The Ward Baking Co., 5659 South La Salle St., Chicago, plans to build a 4 story bakery on South Main St., here. Estimated cost $175,000. Architect not selected.

Me., West Kennebunk—The Amer. Net & Twine Co., 575 Atlantic Ave., Boston, is building a 75 x 100 ft. factory, here.

Mass., Allston (Boston P. O.)—The Atlantic Refining Co., 248 Boylston St., Boston, awarded the contract for the construction of a 2 story, 100 x 200 ft. warehouse and plant on Cambridge St., here. Estimated cost $85,000.

Mass., Salem—Baker & Kimball, 38 South St., Boston, manufacturers of leather, will soon award the contract for the construction of a 3 story, 70 x 175 ft. factory, here. Estimated cost $50,000. Private plans.

Mich., Detroit—Dept. of Street Railways, Shoemaker and St. Jean Aves., plans to build a 1 story, paint shop, on Woodward Ave. Estimated cost $100,000. W. C. Markham, 312 Marquette Bldg., Engr.

Mich., Grand Rapids — Valley City Creamery Co., 666 Lake Dr. S. E., plans to build a 2 story, 40 x 100 ft. creamery. Estimated cost $40,000. H. L. Mead, Grand Rapids, Archt.

Minn., Minneapolis—The Lavoris Chemical Co., 52 Western Ave., is having plans prepared for the construction of a 3 story, 45 x 110 x 143 ft. office and factory building on 3rd St. and 10th Ave., N. Estimated cost $125,000. W. H. Levings, Secy. Long & Thorshov, 1028 Andrus Bldg., Archts.

N. Y., Buffalo—The Niagara Gas Corp., 179 Baraga St., plans to build an addition to its compressor plant. Estimated cost $5,000. Architect not announced.

N. Y., Geneva—The Lisk Mfg. Co., Canandaigua, awarded the contract for the construction of a 160 x 280 ft. enamel ware factory, here. Estimated cost $1,000,000. Noted Sept. 21.

N. Y., Jamestown—The Alliance Furniture Co., 615 Allen St., plans to build a 4 story addition to its factory, to contain 20,000 sq.ft. floor space. Cost will exceed $50,000. Architect not announced.

N. Y., Jamestown—The Empire Case Goods Co., 142 Foote Ave., plans to build a 2 story addition, containing 7,000 sq.ft. of floor space, to its dining room and bedroom furniture factory. Cost will exceed $25,000. Architect not announced.

N. Y., Jamestown—The Jamestown Chair Co., 20 Winsor St., awarded the contract for the construction of a 4 story, 50 x 67 ft. addition to its chair factory. Estimated cost $20,000. Noted Oct. 5.

N. Y., Jamestown — Jamestown Lounge Co., 40 Winsor St., plans to build a 6 story, 102 x 104 ft. addition to its factory. Architect not announced.

N. Y., Long Island City — The Perry Candy Co., 408 West Bway., New York City, awarded the contract for the construction of a factory on Wilbur Ave., here. Estimated cost $75,000. Noted Sept. 21.

N. Y., Randolph—A. and D. Harris, Penfield, plan to rebuild their apple evaporator plant, here, which was recently destroyed by fire. Estimated cost $7,500. Architect not announced.

N. C., Gastonia—Arkray Mills is building a 2 story, 136 x 471 ft. manufacturing plant, to house 20,000 spindles.

N. C., Gastonia — The Flint Mfg. Co., manufacturer of yarns, is building a 2 story, 136 x 385 ft. manufacturing plant, to house 1,200 spindles.

O., Cleveland—The Ferro Enameling Co., 4150 East 56th St., awarded the contract for the construction of a 2 story, 36 x 73 ft. addition to its factory. Estimated cost $25,000.

Pa., Bellefonte—G. Kelley, Port Matilda, R. D., plans to build an ice making plant, here. Estimated cost $18,000.

Pa., Castle Shannon—The Pittsburgh Art Stone Co., 807 Jones Law Bldg., Pittsburgh, is having plans prepared for the construction of a 1 story, 40 x 60 ft. manufacturing plant, here. Estimated cost $25,000. Private plans.

Pa., Jeannette — The American Window Glass Co., Farmers' Bank Bldg., Pittsburgh, awarded the contract for the construction of a 1 story addition to its glass plant, including machine tank buildings, furnace producer plant, boiler and power houses, and addition to cutting room. Estimated cost $1,500,000. Noted Sept. 14.

Pa., Phila.—The Manyunk Plush Co., 108 Levering St., awarded the contract for the construction of a textile factory on Gay and Main Sts. Estimated cost $20,000.

Pa., Phila.—C. Wunder, Archt., 1415 Locust St., will soon receive bids for the construction of a 5 story, 80 x 122 ft. paper factory, on 5th St. and Willow Ave., for Paper Mfg. Co., c/o F. A. O'Neil, 526 Cherry St. Estimated cost $200,000.

Pa., Pottstown—R. A. Reiff, 62 Hanover St., will soon receive bids for the construction of a 2 story, 60 x 190 ft. and 60 x 125 ft. knitting mill. Estimated cost $75,000. J. V. Pooley, 162 2nd Ave., Royersford, Archt.

Pa., Williamsport—The Demarest Silk Co., 607 Railway St., plans to build a 3 story addition to its silk mill. Estimated cost $100,000.

R. I., Pawtucket—J. and P. Coats, Inc., 366 Pine St., awarded the contract for the construction of an addition to its plant, consisting of two 2 and 3 story, 95 x 370 ft. and 95 x 270 ft. buildings, for the manufacture of thread. Estimated cost $400,000. Noted Oct. 5.

R. I., Pawtucket—The Prescott Corp., North Main and Bates Sts., awarded the contract for the construction of a 1 story, 75 x 120 ft. addition to its textile mill. Estimated cost $40,000.

Tenn., Knoxville — The Hall-Tate Co., North Gay St., plans to build a men's clothing factory and wholesale distribution building, 75 x 125 ft., on West Jackson Ave. Estimated cost $150,000. Architect not selected.

W. Va., Clarksburg—The Clarksburg Ice & Storage Co. plans to build a 1 story, 50 x 120 ft. ice plant. Estimated cost $50,000.

Wis., Clyman—The Reeseville Canning Co., Reeseville, plans to build a 3 story factory and warehouse, here. Private plans.

Wis., Milwaukee—A. C. Beck Co., 1 East St., plans to build a 2 or 3 story box factory, to replace one which was recently destroyed by fire. Architect not selected.

Wis., Neenah—The Valley Paper Mills, 145 West Wisconsin Ave., will soon receive bids for the construction of a 1 and 2 story, 80 x 627 ft. mill and a 112 x 144 ft. warehouse. E. A. Wettengel, 578 Pierce Ave., Appleton, Archt. Noted Sept. 29, 1921.

Wis., Stevens Point—Stevens Point Cleaning & Dye Wks., 446 Clark St., awarded the contract for the construction of a 1 story, 30 x 60 ft. cleaning and dyeing plant. Estimated cost $15,000.

Wis., Waukesha—Waukesha Lime & Stone Co. will build a 2 story, 50 x 120 ft. pulverizing plant, to replace the one which was destroyed by fire. Estimated cost $50,000. Private plans.

Wis., Wittenberg—The Holman Mfg. Co., 1910 North 13th St., Sheboygan, plans to build a 2 story, 60 x 95 ft. clothing factory, here. Estimated cost $50,000. H. Holman, Pres. Architect not selected.

B. C., Vancouver—The Seaman Paper Mills, 208 South La Salle St., Chicago, plan to build a paper mill here. Estimated cost $3,000,000. V. D. Simons, 39 South La Salle St., Chicago, Engr.

Ont., Niagara Falls—Dominion Canners, Ltd., c/o Chamber of Commerce, plans to build a large canning and packing factory on a five acre site. Cost will exceed $50,000.

Ont., Paris — Penmans, Ltd., manufacturer of woolen underwear, is having plans prepared for the construction of an addition to its factory. Estimated cost $50,000.

Que., Montreal, East—The Red Star Refineries Co., Ltd., Canada Cement Bldg., Montreal, plans to build a refinery, 1,000 bbl. per day capacity. Estimated cost $250,000.